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FACTORY

MANAGEMENT AND MAINTENANCE

OCTOBER 1948

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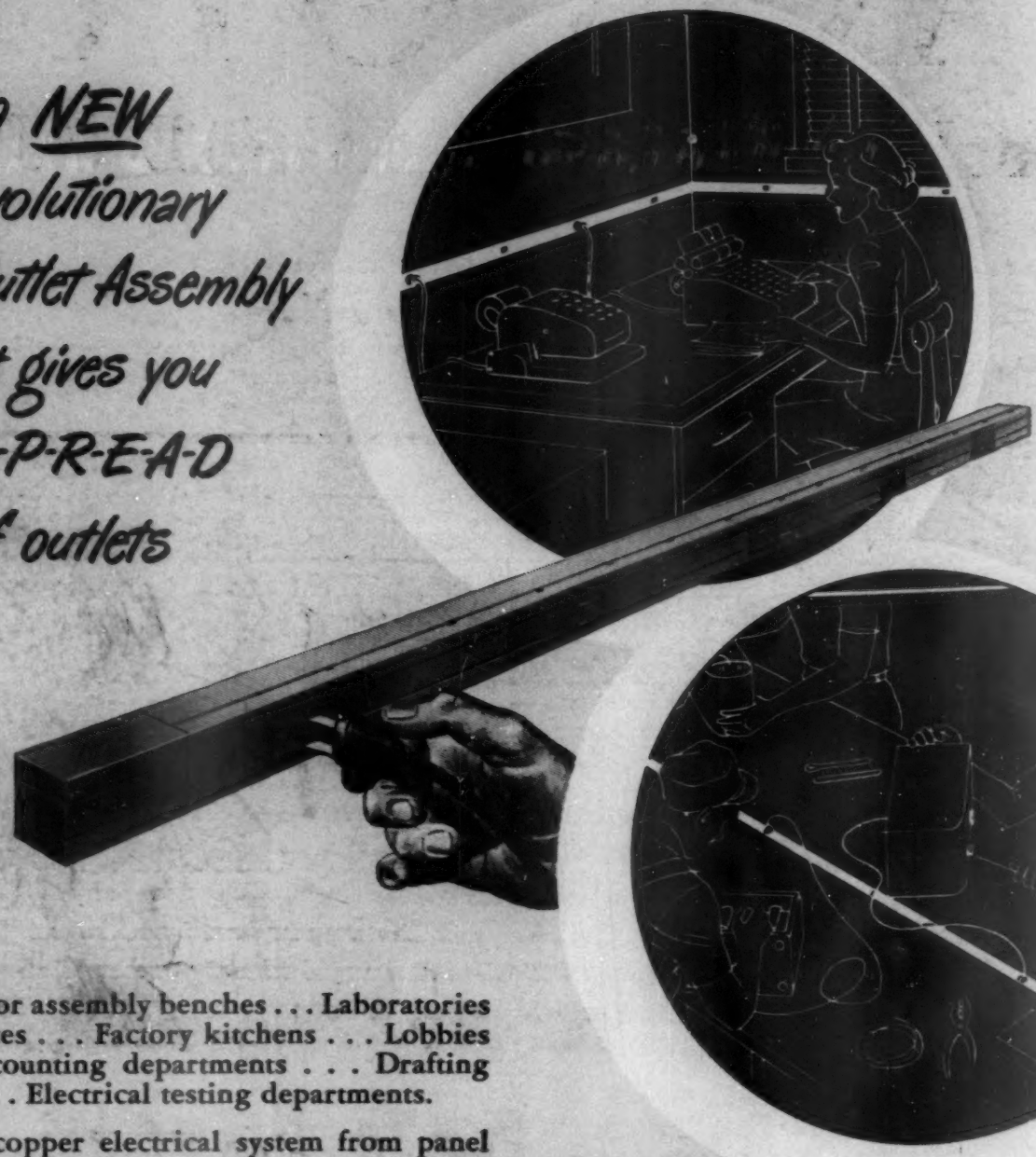

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INDUSTRY ORDERS AND MATERIALS POLICY

WASHINGTON IS OFFERING American manufacturers a billion dollars' worth of war orders, on a standby basis. And this may be just the start.

The Munitions Board reports that its purchasing policy will remain unchanged for the present—which means government and industry won't be competing for scarce items. Joint Chiefs of Staff gave M-Day requirements to Board just ten days ago.

Tuning up production to supply the planes required by a 70-group air force, aircraft manufacturers are once more experiencing growing pains. The bottleneck: Personnel, particularly engineers.

American shipyards are booming again with orders totaling well over half a billion dollars already placed, and plenty more to come.

MANUFACTURERS GET PHANTOM WAR CONTRACTS

A BILLION DOLLARS in government war contracts—on an "if, as, and when" basis—will be offered American manufacturers very soon. These "phantom" orders would not become effective unless Washington flashed the green light on some future M-Day. Meanwhile, however, industry will:

1. Learn what government needs are; exact types and quantities.

2. Know about what prices would be paid for these products.

3. Have an opportunity to compute its needs in manpower, materials, capital, in case these contracts must be fulfilled.

Planners at National Security Resources Board, who developed the scheme, hope it will save anywhere from 5 to 12 months in time required for industrial mobilization.

The board also is working out a priorities system, under which companies participating in the program will be able to obtain the necessary materials to complete their orders without delay.

First contracts, NSRB reports, will go to machine tool builders, for 100,000 units of production-line equipment. Such items were critically short at the beginning of World War II.

Reactions from industry to the plan are almost universally enthusiastic. Said one executive:

"This is a big step forward from the situation that existed before the last war. The plan offers a logical solution to the production problems which arise as soon as a national emergency is declared."

The NSRB program, as seen in management circles, offers seven benefits to industry:

1. Exact cutbacks in civilian production, in order to fill war contracts, can now be calculated.

2. Industry can allot plant facilities for future emergency production.

3. Plant training programs for war production can go forward.

4. Estimates of materials for war production can be prepared.

5. Months will be saved in drafting and designing tools and facilities.

6. Manning tables can be figured for top-priority grades of manpower in the event of war.

7. The load of original design activities is distributed over a much longer period of time, conserving scarce engineering talent as well as avoiding future bottlenecks.

If the present program goes over well, NSRB is reported to have billions more in similar contracts ready to hand out.

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STOCKPILERS REVEAL FALL PURCHASE LIST

DESPITE being 75 per cent short of its goal, the Munitions Board is going to continue to build the national stockpile slowly. This was the gist of the board's recent report to Congress. This course is not dictated by choice, but by current necessity. Markets in stockpile materials are tight, prices high. And the board does not have the funds to fill in the gaps, even if the items were available.

The stockpilers listed as "material on hand" 17.6 per cent of the 1951 goal, of which all but 5 per cent came from war surpluses. "Materials in sight" included another 7.4 per cent of the goal.

To Rear Adm. Roger W. Paine, a key official of the Munitions Board, such a condition of things was "very bad." He urged an immediate increase of stockpiling funds, added a warning that business and industry might have to step aside for the agency.

That time is not yet, however. Projected purchases for the next three months are modest enough, the Munitions Board asserts, "to demonstrate conclusively the relatively minor impact" this program will have on the national economy.

Then, setting a precedent, the agency listed 28 strategic and critical materials and the amounts to be purchased in this quarter for delivery next year. Surprising to some, no radium or uranium was listed.

It is the opinion of market experts that few, if any, of these stockpile items are of sufficient size to raise current prices. Moreover, private firms are doing some of the buying for the Munitions Board, and large industrial purchasers have agreed to turn over about 2 per cent of their material to the government.

JOINT CHIEFS ISSUE M-DAY PLAN TO BOARD

LATE IN SEPTEMBER, the Joint Chiefs of Staff handed the Munitions Board a top-secret document labeled "The armed forces' schedule of requirements." It tells *what* and *how much* the Army, Navy, and Air Force will need on Mobilization Day and immediately afterward.

To arrive at these estimates, the Joint Chiefs of Staff first wrote a strategic concept of the kind of war America might have to fight. Some military observers believe this concept goes no further than the initial stages of the conflict—a war primarily of defense, while the United States mobilized for attack.

Weighing the factors, known and unknown, the Joint Chiefs have been able to say, in effect:

1. Here is the plan for the opening stages. We will need X men, Y planes, Z warships.

2. Based on these requirements in men and matériel, here is what American industry will have to give us, as soon after M-Day as possible.

It is No. 2, in all its vast and intricate detail, that the Munitions Board has just acquired.

To military observers, the significance of the document lies in its being completed many months ahead of schedule. They say it enables the board to deal in concrete problems instead of guessing; and that industry can look forward to answering soon some questions on production of many types of matériel.

PLANEMAKERS SCOUR MARKET FOR ENGINEERS

TUNING UP to supply the 70-group air force, the U.S. aircraft industry is once more experiencing growing pains. Chief problem at the moment is personnel, especially top-level engineers.

There are two reasons for this shortage—and prospects are poor that this bottleneck will be broken at any time in the near future.

First, engineers can no longer be recruited wholesale from the automotive, electrical appliance, and other industries—as they could when the war cut back consumer production to a dribble.

Second, much more engineering goes into post-war planes. Said Arch Dutton, engineering manager for Northrop Aircraft: "Testing the component parts of a new model now requires more engineering man-hours than were spent in pre-war days for a complete engineering job on a new model."

One firm, hit by the shortage more severely than almost any other, first tried newspaper and radio advertising to get the needed specialists. When that didn't work, it sent recruiting agents to other industrial centers—Detroit, New Orleans, Houston, and so on. That helped some but not enough, the company reports, and it is still scouring around for more engineers as this is written.

SHIPYARDS HUM WITH MILLIONS IN NEW ORDERS

LIKE THE PLANEMAKERS, U.S. shipbuilders hung up record after record in World War II. Their ability to turn out vessels astonished everyone, including themselves. Then the war ended and the bottom fell out of the market. By the end of 1947, most shipbuilding yards were moribund; the rest kept going chiefly on alteration and repair work.

Now, in the nine months since, that's all changed. Orders have jumped from 26 ocean-going vessels to 72 tankers, dry-cargo ships, and passenger liners worth $500,000,000. In addition, private yards will share in the Navy's $545,000,000 building and conversion program for 1948-49. And many more orders are in the works for both merchant and fighting ships.

Current estimates are that this business will keep American shipyards rolling at capacity through 1951.

Tankers—61 on order; 52 for U.S., 9 for foreign nations. Largest (two) will be 30,000 tons' carrying capacity. Orders for many more tankers are now being negotiated.

Dry cargo ships—5 on order—2 for U.S.; 3 for foreign nations.

Passenger vessels—5 ships, all for U.S. Two of these will be 972-passenger liners. Cost, $25 million each. The other three, worth $10 million, will carry 230 passengers. Maritime Commission has asked builders for estimates on a 2000-passenger superliner. Cost, around $65 million.

A hopper dredge completes the list of 72 civilian ships actually on order.

Navy plans for 1948-49 call for 16 new ships, conversion of 33 others. All the latter will be handled by Navy yards. But $313 million in new-ship construction has been earmarked for private firms.

FACTORY
MANAGEMENT AND MAINTENANCE
L. C. MORROW, EDITOR

DISTINGUISH BETWEEN PRODUCTION AND PRODUCTIVITY

PRODUCTION is *amount*. Productivity is *rate*. All kinds of controversies can come about if the two terms are used to mean the same thing or if each is used to mean what the other actually stands for. Not all management personnel is able to distinguish, so worker personnel cannot be expected to either. Yet the one should be able to explain to the other.

When economists said (and quite truthfully) that this country needed more *production*, they meant that the quantity of goods being produced was not enough to satisfy the needs of the people. It was usual to explain that, because goods were few, buyers were bidding for them and consequently prices were high. Also, the conclusion was offered that if we could make enough goods to fill the pipelines of distribution and feed into those lines as withdrawals were made, bidding by buyers would cease, and the makers of the goods would have to offer the bait of lower prices to sell them.

Productivity Raises Buying Power

When it is said (and also quite truthfully) that we need greater *productivity*, what is meant is that we need greater output in factories for each man-hour of work. And it is usual to explain that, as output per man-hour goes up, the cost of production per unit of whatever is being made goes down. When cost is down, prices can be reduced as competition so demands. As prices go down, more people can buy.

In connection with productivity, it must be made clear that the definition does not concern itself entirely with the physical effort of the worker. *It also measures the effort of management.* The two variables are inseparable; productivity can never measure either alone or fix responsibility definitely. If everything but the worker effort remained the same (machines, tools, materials, and designs did not change in kind or availability), then productivity would be an accurate measurement of worker effort. But machines are being improved continuously; so are tools; materials may be plentiful or scarce, and their characteristics may vary; designs are not likely to be static. Nor can worker effort remain the same; rate of turnover alone would affect it. Therefore, it is the combined effort of management and workers that is being measured, management being taken as inclusive of all the plant personnel except the wage earners.

As FACTORY measures it, productivity for a given factory for a given period equals the dollar value of the product for that period, corrected for price changes, divided by the total number of hours worked by the wage earners.

Compare A-Bombs and Automobiles

One atomic bomb cost some billions of dollars. The output per man-hour of work was infinitesimal. How many automobiles have been made for the same amount of money? Almost every family has, or expects to have, an automobile. Practically nobody can have an atomic bomb. There could be no more striking example of what output per man-hour of work—i.e., productivity—means to America.

It is easier to understand about production than productivity. Even if everybody wanted an atomic bomb, only a hundred people could have them if the bomb factories made only a hundred. People don't want the bombs, but they do want the cars, the tractors, the ploughs, the refrigerators, the television sets, and the hundreds of other things our factories make.

The nation has to have *production*. And in order to get it, the factories must have *productivity*. Both management and workers are responsible for giving us productivity. When productivity is high enough, prices will be low enough that production will be big enough. It is a simple story, this one of production and productivity, and a true one. It is a story that both management and labor should learn, and should tell often. But both management and labor must accept their responsibility for doing as well as telling.

L C Morrow

FACTORY'S FIFTH ANNUAL SURVEY
OF WORKER OPINION

SPECIAL PRE-ELECTION REPORT

What the Factory Worker Really Thinks

About the Taft-Hartley Law and Labor in Politics

1. He thinks he is as well or better off than he was under the Wagner Act
2. He is less opposed to the Taft-Hartley law than he was a year ago
3. He thinks the election will not affect the 1949 strike picture
4. He disapproves of unions advising members how to vote
5. He is more likely to be a Republican than he was in 1944

ONE YEAR AGO, AFTER ANALYZING THE REPLIES to its fourth survey of worker opinion (November, 1947), FACTORY said flatly:

"Workers have politics firmly fixed in their minds, but not necessarily because of the Taft-Hartley law . . . *Labor legislation is not the hot political issue union brass hats thought it was.*"

The greatly increased acceptance of the Taft-Hartley law, the opposition to unions advising members how to vote, and the shift to the Republican Party, all disclosed by this new survey, underscore FACTORY's conclusion of a year ago. Because the McGraw-Hill Research Department used the most modern sampling techniques in making this survey, FACTORY believes that the results are representative of current opinion of non-supervisory factory employees throughout the nation—and that the national election will prove its accuracy.

* * *

Interviews were made in 34 states containing 97 per cent of all factory workers. Allotment of interviews was in proportion to geographical concentration of manufacturing workers, type of industry, size of plant, union membership (or non-membership), age group, and sex.

The following geographical designations are used:

New England: Conn., Me., Mass., N. H., R. I., Vt.

Middle Atlantic: N. J., N. Y., Pa.

East-North-Central: Ill., Ind., Mich., Ohio, Wis.

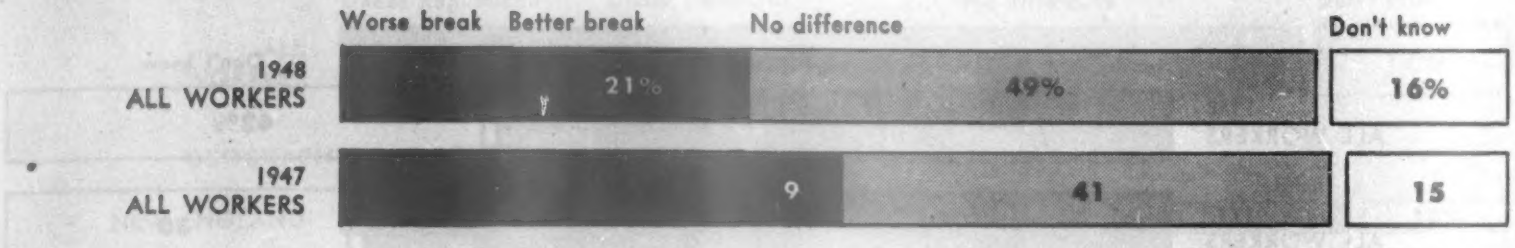
South: Ala., Ark., Del., Fla., Ga., Ky., La., Md., Miss., N. C., Okla., S. C., Tenn., Tex., Va., W. Va.

West: Ariz., Calif., Colo., Iowa, Idaho, Kan., Minn., Mo., Mont., Neb., N. D., N. M., Nev., Ore., S. D., Utah, Wash., Wyo.

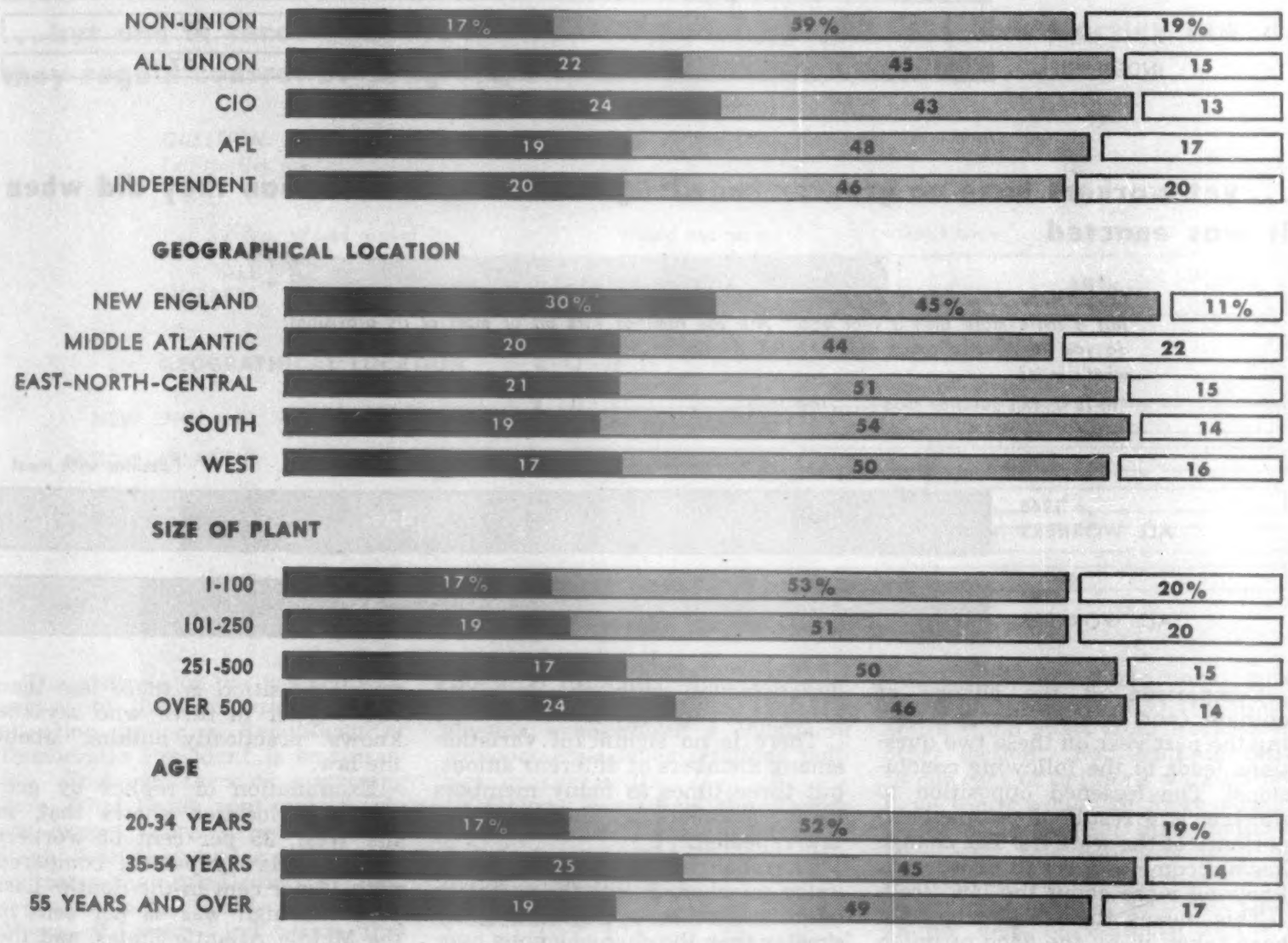
This special pre-election report is the first of three articles based on FACTORY's fifth annual survey of "What the Factory Worker Really Thinks." The remaining articles will appear in the November and December issues.

1. Seven workers in ten think they are as well or better off under the Taft-Hartley law as they were under the Wagner Act...

QUESTION: Do you believe that you personally get a better or worse break under the Taft-Hartley law than under the old labor laws, or doesn't it make any difference?



...and among all union, regional, plant size, and age groups, only in the CIO are there as many as two workers in ten who believe they get a worse break


UNION AFFILIATION
NON-UNION 17% 59% 19%
ALL UNION 22 45 15
CIO 24 43 13
AFL 19 48 17
INDEPENDENT 20 46 20
GEOGRAPHICAL LOCATION
NEW ENGLAND 30% 45% 11%
MIDDLE ATLANTIC 20 44 22
EAST-NORTH-CENTRAL 21 51 15
SOUTH 19 54 14
WEST 17 50 16
SIZE OF PLANT
1-100 17% 53% 20%
101-250 19 51 20
251-500 17 50 15
OVER 500 24 46 14
AGE
20-34 YEARS 17% 52% 19%
35-54 YEARS 25 45 14
55 YEARS AND OVER 19 49 17

ANALYSIS: One fact stands out: *The Taft-Hartley law is not an effective vote-getting issue in the 1948 campaign.* An overwhelming majority of workers reject the union propaganda which claims that Taft-Hartley is a "slave labor" law, or even a pro-management law.

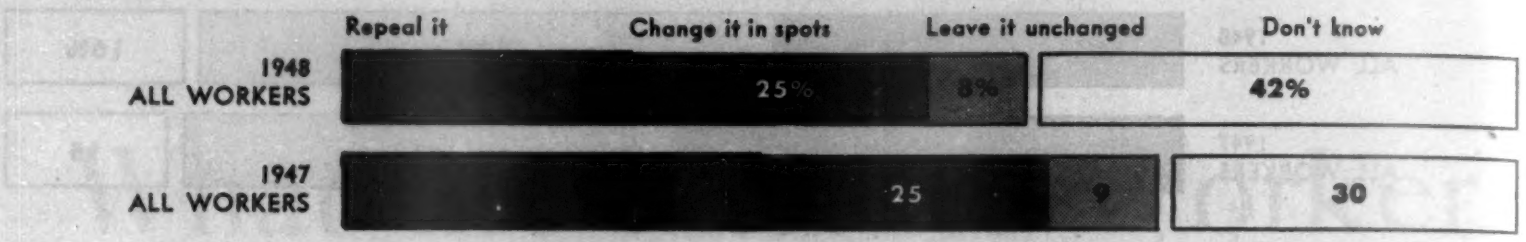
Only 14 per cent think they get a worse break under the new law, compared with 21 per cent of all workers who think they get a *better* break.

Not to be overlooked is the tremendous shift in opinion that has taken place since FACTORY asked this same question one year ago. Last year, apparently reacting to the "scare" talk of the unions, 35 per cent of workers said they were getting a worse break (the figure was 47 per cent among CIO members), while only 9 per cent thought they were getting a *better* break. Now that workers have had a year's experience with the law, and can form their own opinions instead of relying on the dire predictions of union "analyses," the picture is almost reversed.

CONTINUED ON NEXT PAGE

2. Only one worker in four wants the Taft-Hartley law repealed, compared with just about one in three a year ago . . .

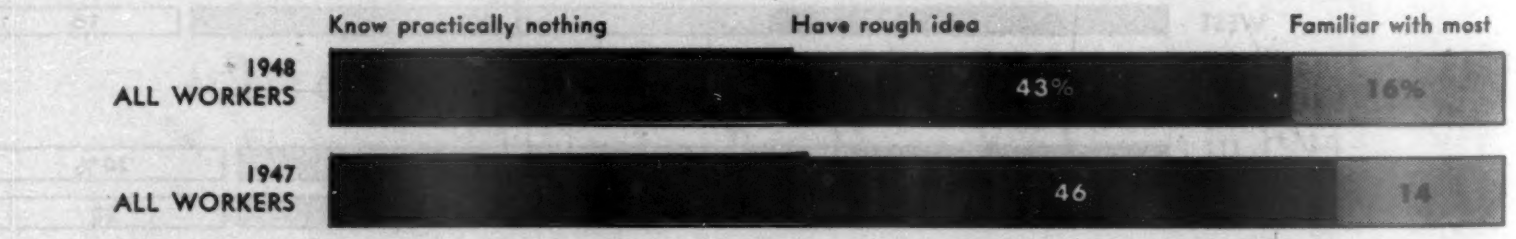
QUESTION: Do you think the Taft-Hartley law should be left unchanged, changed in spots, or repealed entirely?



. . . yet workers have no greater knowledge of the law itself than they did when it was enacted

QUESTION: The Taft-Hartley law, which affects labor unions, was passed by Congress just a little more than a year ago. Are you familiar with all or most of its provisions; do you have just a rough idea of what it says; or do you know practically nothing about what's in it?*

**In 1947, this question read " . . . last June."*



Comparison of the change of opinion (and lack of change) during the past year on these two questions leads to the following conclusions: The lessened opposition to the law is a result of *personal* experience of the workers. The change has *not* come as a result of workers knowing more about the law itself.

This means the worker has not been taken in by the flood of union propaganda and misinformation. It means also that the *net* effect of management's attempt to educate the worker about the law has been practically nil. It seems that management's program may have served to offset the union campaign.

There is a warning here for management. Attempts to inform the worker about the Taft-Hartley law must continue, and must increase in effectiveness, if the unions are to be checked in their campaign to create dissatisfaction with the law and bring about its repeal.

There is no significant variation among members of different unions, but three times as many members as non-members say they want the law repealed.

The change in sentiment among union members during the past year on this question has been slightly greater than the change among non-members. Those saying the law should be repealed, for 1948 and 1947, respectively: Union members, 30 and 46 per cent; non-members, 10 and 15 per cent; all workers, 25 and 36 per cent.

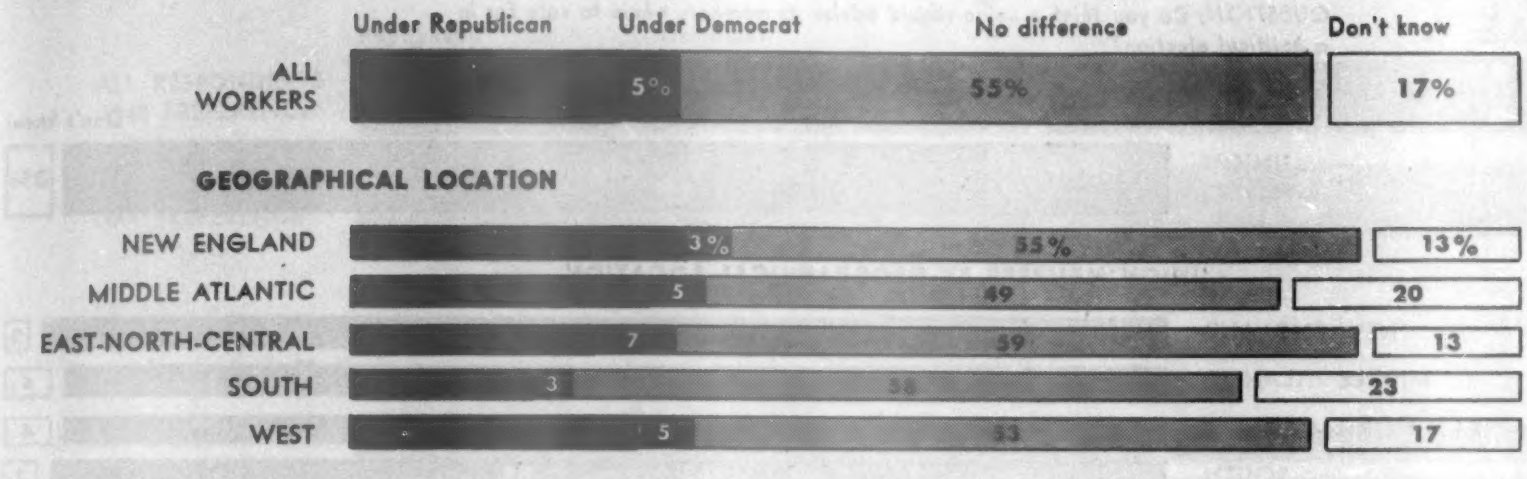
Among union members, the percentage of workers claiming to be familiar with "all or most" of the law (CIO, 21 per cent; AFL, 17 per cent; independent, 21 per cent) is more than double the figure among non-members (8 per cent). But in *no* classification is there less than one worker in three who says he knows "practically nothing" about the law.

Examination of replies by geographical location shows that, in the West, 35 per cent of workers want the law repealed, compared with 17 per cent in the South. Last year the high was 43 per cent in the Middle Atlantic States, and the low was 20 per cent in the South. Just as a year ago, workers in New England are most likely to believe they are familiar with all or most of the law (25 per cent); in no other section does the figure exceed the average of 16 per cent.

(In analyzing replies to the second question above, it must be kept in mind that the measure is what the worker *thinks* he knows about the law, not what he actually does know.)

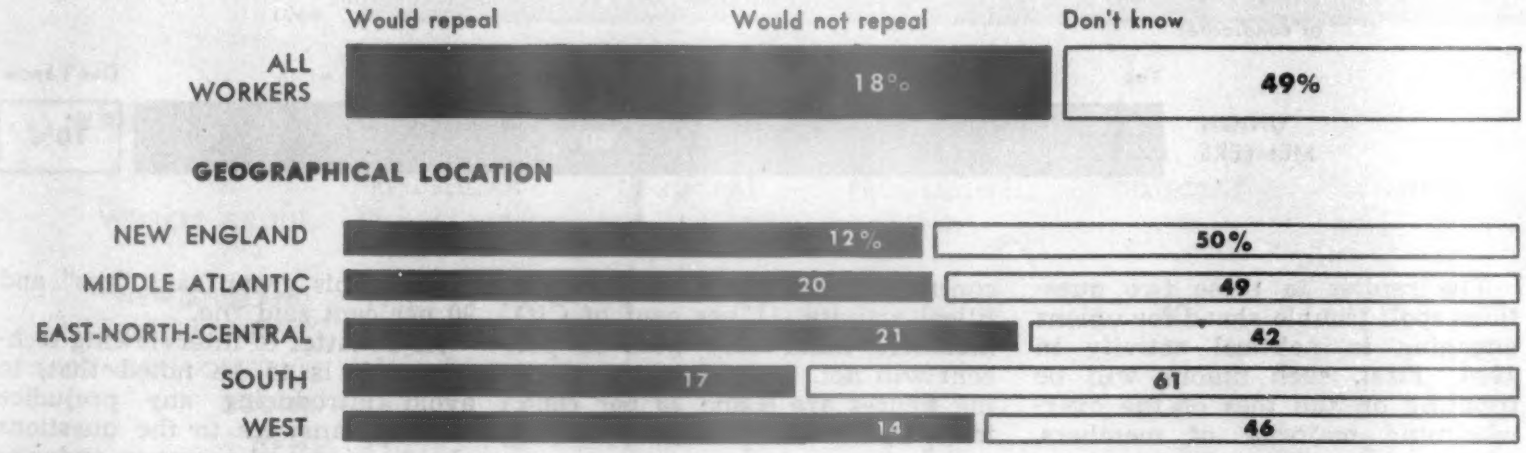
3. Most workers believe the election outcome will have no bearing on the 1949 strike picture . . .

QUESTION: Do you think there would be more strikes next year under a Republican or Democratic President, or would it make no difference?



. . . but one in three believes the Democrats will repeal the Taft-Hartley law if they regain control of Congress, and half are not certain

QUESTION: If the Democrats controlled Congress, do you think they would repeal the Taft-Hartley law?



The attitude of the worker with regard to the comparative strike situation under a Republican or Democratic President is encouraging. However, there is a warning here. That 18 per cent more workers expect more strikes under a Republican than under a Democrat indicates that pro-Democrat union propaganda has made itself felt. There is every indication that union propaganda will continue—and will even increase in bitterness—between now and the election in November.

At the time of this writing, it seems doubtful that such charges will have much effect on the election. But because these charges almost invariably associate management with Republicanism — and both with reaction and even fascism—they may well have a serious and lasting effect. Management's course is clear: *It must not give workers reason to believe that any election ever caused a change in management's labor relations policies, or ever will.*

Opinions regarding the Democratic platform plank pledging repeal of the Taft-Hartley law indicate two things:

1. There is a great deal of confusion in the worker's mind, probably because of the contradictory stands of the President (who vetoed the bill) and the majority of Democrats in Congress (who voted *for* enactment).

2. Of those workers who believe that the Democrats would repeal the Taft-Hartley law, only 45 per cent actually want it repealed; 9 per cent want it left unchanged; and 27 per cent believe that the law should be changed in spots.

Geographical distinctions are sharp only in that workers in the South stand apart from workers in other sections. For example, only 16 per cent of southern workers believe there would be more strikes under a Republican than under a Democrat; this contrasts with 29 per cent in New England and 21 to 26 per cent in other sections. Only 22 per cent of southern workers believe the Democrats would repeal the Taft-Hartley law; western workers are at the other extreme, 40 per cent. The remaining sections of the country register 31 to 38 per cent.

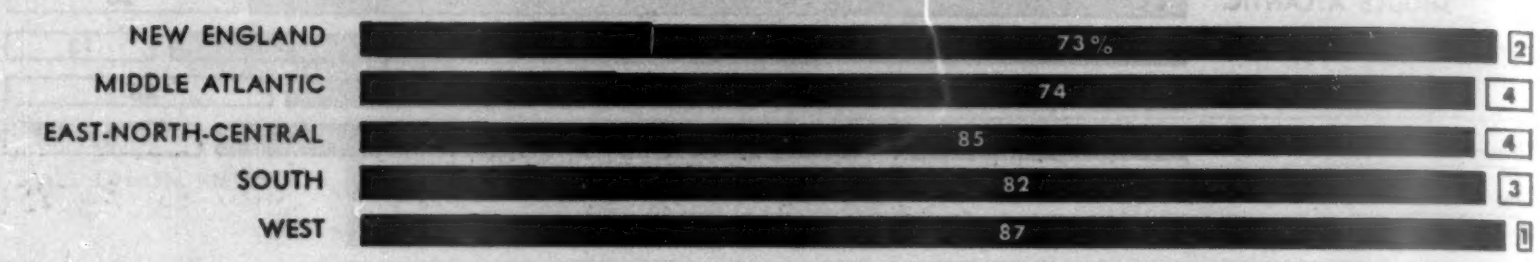
Differences in opinion of union and non-union groups are extremely slight on the matter of strikes, 24 and 20 per cent, respectively. On repeal, the difference is greater but not overwhelming; 37 and 25 per cent.

CONTINUED ON NEXT PAGE

4. Eight union members out of ten disapprove of unions advising members how to vote . . .

QUESTION: Do you think a union should advise its members whom to vote for in a political election?

UNION MEMBERS BY GEOGRAPHICAL LOCATION



. . . and only one union member in ten expects to contribute money to any campaign or candidate

QUESTION: Do you think that this year you will contribute money to any political campaign or candidate?

The replies to these two questions spell trouble ahead for unions engaging in political activity in 1948. First, such unions will be treading on the toes of the overwhelming majority of members, who oppose unions advising members which candidates to vote for in a political election. Second, such unions will have a difficult time raising the funds necessary to support any large-scale political activity in 1948.

Particularly significant is the *lack* of variation of opinion among the different union groups. Within CIO, 18 per cent favor political endorsements, 79 per cent oppose. Corresponding figures for AFL are 13 and 84 per cent; and among members of independent unions, 13 and 83 per cent. On the matter of contributing money to support political activity, 11 per cent of CIO members think they will; 79 per cent will not. In AFL, corresponding figures are 8 and 83 per cent; in independent unions, 10 and 80 per cent.

* * *

FACTORY also asked, "Do you think a company should advise its workers whom to vote for in a political election?" The reply was 3 per cent "yes" and 93 per cent "no." The figures were the same for "all workers" and for "union members only." There were no variations of any consequence among regional, union affiliation, or plant size groups. Workers aged 55 and over, however, were slightly more inclined to favor political endorsements by companies; 6 per cent of this group said "yes" and 90 per cent said "no."

As a matter of interviewing technique, it is to be noted that, to avoid introducing any prejudice into the answers to the questions about union and company endorsements, FACTORY asked the "company" question as the ninth of 29 questions; the "union" question was next to last.

To determine actual practice by companies, FACTORY also inquired whether or not the worker's employer had suggested that he vote for any particular candidate, either for Congress or for President. Two per cent said "yes"; 96 per cent, "no." There were no significant variations from this average in any of the classifications analyzed.

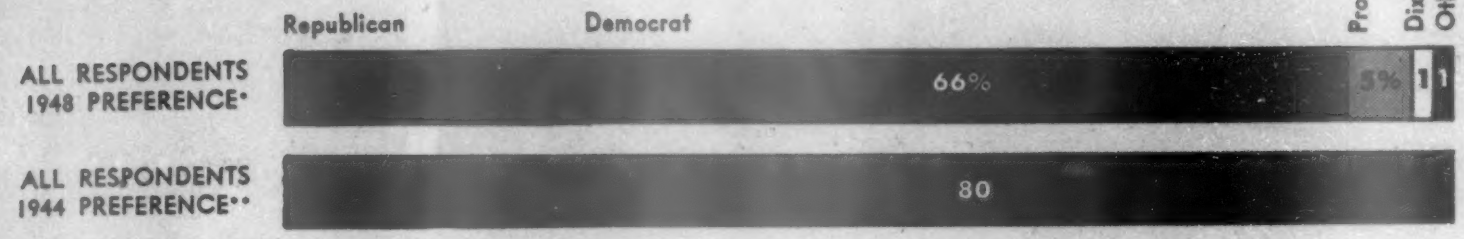
Parts Two and Three of FACTORY'S Fifth Annual Survey of Worker Opinion will follow . . .

IN NOVEMBER—What the Factory Worker Really Thinks About Prices, Profits, Wages, and Strikes

IN DECEMBER—What the Factory Worker Really Thinks About His Company, His Foreman, and His Union

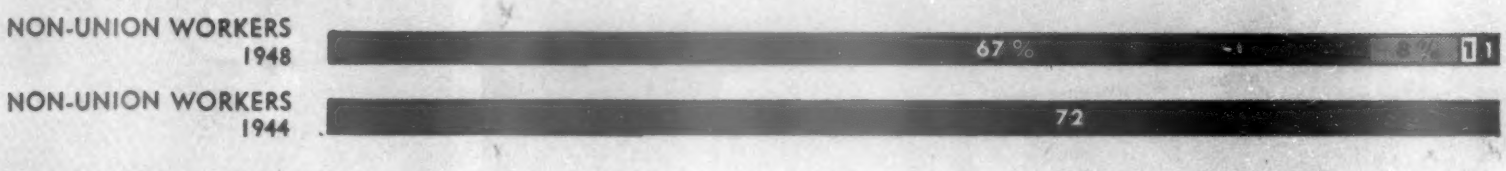
5. There has been a marked shift of sentiment toward the Republican Party...

QUESTION : By the way, are you either a Republican or a Democrat, or what other party?
QUESTION : Whom did you vote for in the last Presidential election?



...but it has all been among union workers...

...and the trend among non-union workers has been the other way...



...while regions and unions present varying patterns

WORKER GROUP	REPUBLICAN 1948	REPUBLICAN 1944	DEMOCRAT 1948	DEMOCRAT 1944	PROGRESSIVE 1948	DIXIECRAT 1948	OTHER 1948	OTHER 1944
NEW ENGLAND	15	18	76	82	7	—	2	—
MIDDLE ATLANTIC	31	22	59	78	10	—	†	—
EAST-NORTH-CENTRAL	37	23	60	77	3	†	†	—
SOUTH	16	13	77	87	3	4		—
WEST	24	16	71	82	3	—	2	2
CIO	30	14	64	86	5	1	†	—
AFL	28	20	67	80	4	—	1	—
INDEPENDENT	24	19	70	79	5	—	1	2

†Less than ½ of 1 per cent

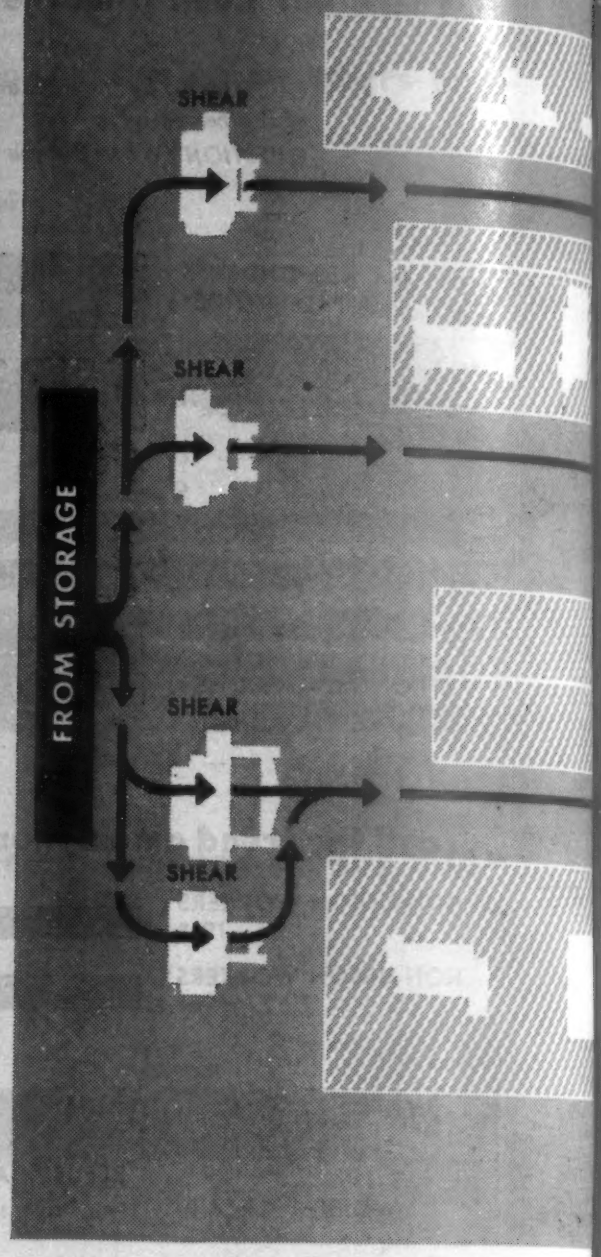
*Figures shown are percentages of those who *answered* the question; some workers refused to answer, said they did not expect to vote, or were "independent." Of all workers *asked*, 19 percent did not specify a party or candidate, 22 per cent said Republican; 53 per cent, Democratic; 4 per cent, Progressive; 1 per cent, Dixiecrat; and 1 per cent mentioned other specific parties.

**Figures shown are percentages of those who cast ballots in 1944. Of *all* workers, 30 per cent did not vote, 14 per cent voted for Dewey, and 56 per cent voted for Roosevelt.

Replies to FACTORY's questions regarding political preference among workers in 1944 and in 1948 indicate that the Republicans are gaining ground on the Democrats not only relatively (because of Wallace's Progressive Party), but also in terms of actual numbers.

When respondents are classified by geographical location, union affiliation, plant size, and age, two exceptions to this general trend are disclosed. Among non-union workers, the absolute number who consider themselves Republican (and, presumably, will vote Republican) is now 23 per cent, compared with 28 per cent who actually voted Republican in 1944. However, because of the shift to Wallace, the Republicans are relatively stronger, compared with the Democrats, than they were in 1944. Exactly the same situation exists among workers in New England, where the absolute number of potential Republican votes has fallen to 15 per cent from the 18 per cent of actual votes cast in 1944. There are no other significant variations.

HANDLING steel at receiving dock. One man can move five tons at a clip by means of traveling crane with sheet lifter which extends over platform



LAYOUT was designed to provide for maximum utilization of mechanized

IMPROVED HANDLING AND LAYOUT

Introduction of proper materials handling methods required a new layout. It was a big job but worth it

G. L. DOBSON · CHIEF PRODUCTION ENGINEER, TAPPAN STOVE COMPANY, MANSFIELD, OHIO

THE DRIVE TO REDUCE pressroom operating costs at Tappan Stove Company was aimed right at materials handling. Handling operations were important in cost. As always, they added nothing to the final product.

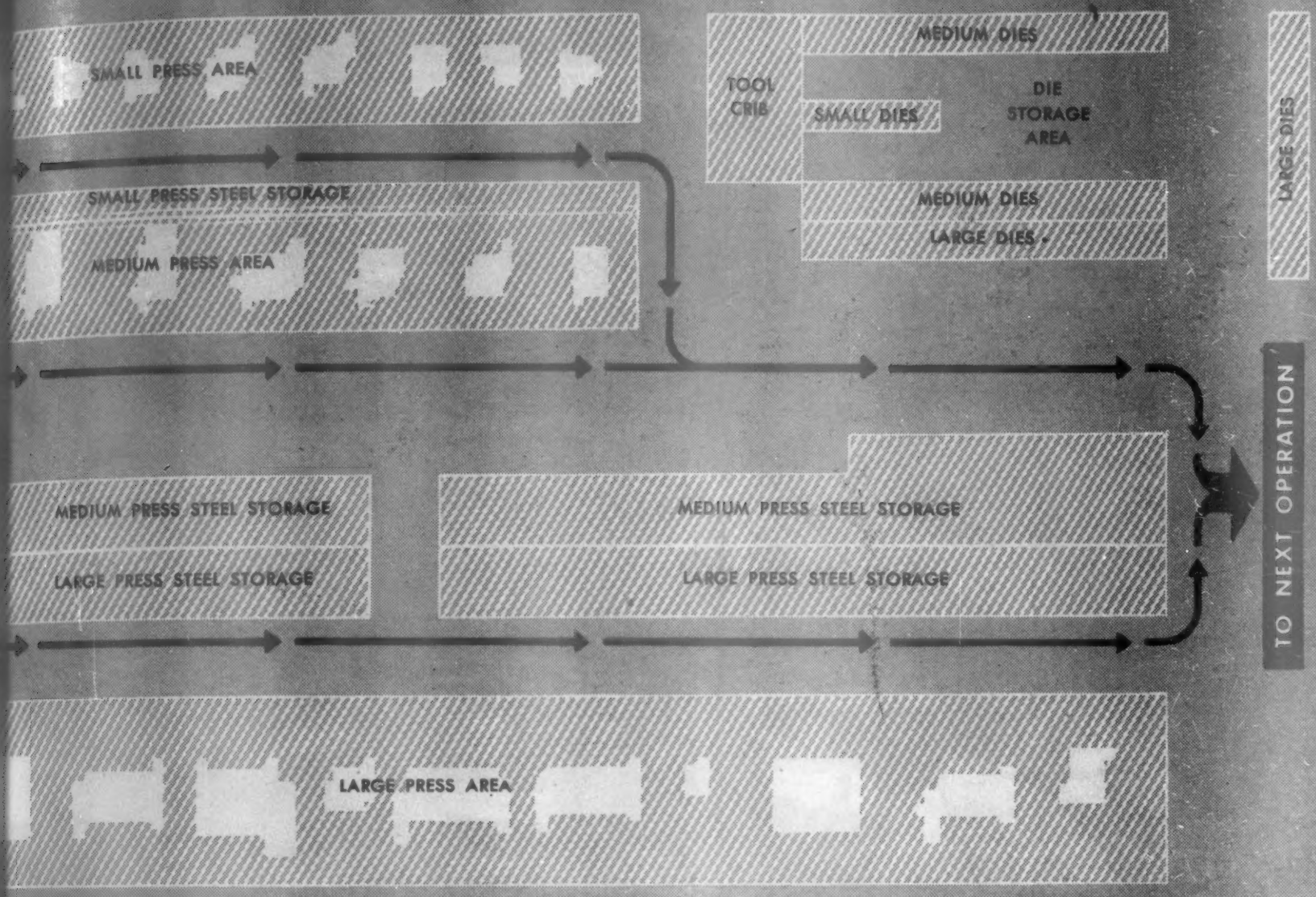
Study of existing handling methods resulted in a new layout, a new flow of work, and some new equipment. Idle shear and press time was reduced. The ratio of aisle space to storage space was reduced. Unloading time for sheet steel was cut sharply.

The layout diagram shows the new material flow. Sheet steel enters at lower left and is placed in temporary storage. When needed, it is moved to the scales, weighed, and delivered to the proper shears to be sized.

One man with a 5-ton traveling crane, equipped with a sheet lifter, does all the steel handling to this point. Incoming trucks loaded with steel are emptied by the crane in about 20 minutes. Formerly, four men with hand trucks required several hours to do the job.

By using the crane in the storage area, steel can be stacked to higher limits than with hand handling, and the stacks can now be placed perpendicular to the service aisles instead of parallel. This practice greatly reduced the number of service aisles, and conserved valuable storage space.

Under the old system, shear operators and helpers had to leave their shears to get steel from storage. That practice has been ended.



materials handling equipment in press room at Tappan Stove. Straight-line flow eliminates the confusion and waste motion that resulted from back-tracking with the old arrangement. Presses are lined up according to size

PAY OFF IN ONE YEAR

The man with the crane supplies four shears.

Three press lines were established—one each for small, medium, and large presses. Each line has its own temporary storage area immediately across the aisle from it. Work flows to one or a series of presses with a minimum of back-tracking, a major criticism of the old layout. Where a number of presses of the same size are involved in succeeding operations, work flows from one press to the following on gravity slides.

The Former Arrangement

The former layout consisted of a line of large presses down one side of the room. On the other side was a series of dead-end branch aisles. Each aisle served the group of presses surrounding it. Work in process was stored in a central storage area on skids or small trucks. Under the old system, new dies were made for presses having the smaller work loads, regardless of press location. This resulted in a disorderly flow of parts. Line of flow was further disrupted because branch aisles had no storage space provision. Material for each operation had to be brought from the central storage area and then returned to it, following completion of the operation.

Die storage and handling were given considerable attention. Formerly dies were obtained from storage by the pressmen and moved on a hydraulic-platform hand truck. As die size increased, it was necessary to have more men to push the truck.

How It Is Done Now

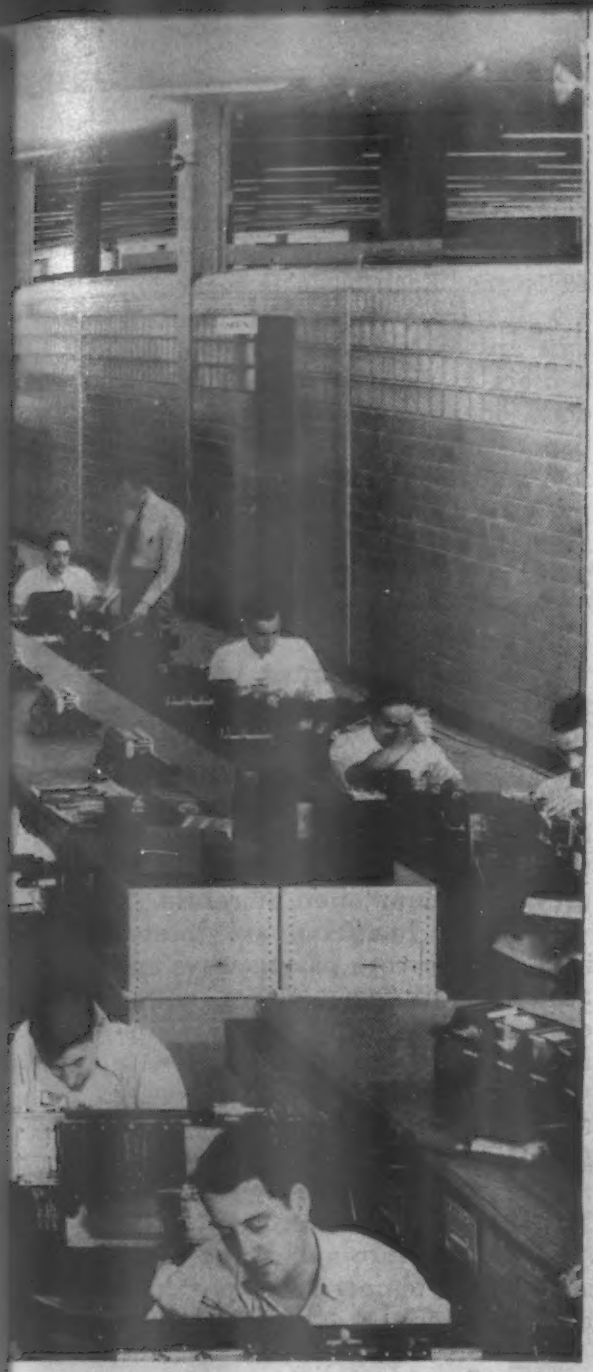
Now all dies are procured from and returned to storage by the operator of a new fork truck. Since the truck's vertical stacking limit is higher than that of the hand truck, dies are tiered on much higher racks, freeing more space.

The cost of the raw-steel-handling equipment was saved in less than a year. Saving in space has considerably increased capacity. The objective was accomplished—handling costs were cut.

GOOD WORKING CONDITIONS at IBM mean more than clean, well-ventilated, and well-lighted areas. They mean quiet and eye-pleasing appointments. They mean a feeling of comfort comparable to home

ATTRACTIVE WASHROOM FACILITIES include individual washbasins and private lockers. Note foot-pedal for water at each basin

SERVICE EQUIPMENT, such as dust collectors, telephone dial sys-



Thoughtful placement of employee facilities insures easy access

tem, and motor-generator sets are centralized in attic truss space

IN THIS NEW PLANT WORKERS COME FIRST

EMPLOYEES at International Business Machines are considered the corporation's single biggest asset. Therefore, whatever goes into the design and construction of a new IBM manufacturing plant and its equipment must pass the test of its effect on employee welfare, safety, and comfort.

The company believes that only under good working conditions can its employees relax from physical tensions sufficiently to *think* about improving their job and the company's product. It views this philosophy so seriously that a single-word reminder, "THINK," is posted everywhere in all its plants.

And so it was quite in character that plenty of thought went into the plans for the new factory unit at Poughkeepsie, N. Y. Every detail was measured by its contribution to better working conditions. As a result, the new unit possesses a combination of features, many of them new, that have made it a nice place in which to work. Nice because the desirable employee likes to work in a clean, well-ventilated, and well-lighted area. He likes neat and attractive employee facilities. He likes quiet and eye-pleasing appointments. And he appreciates all the materials handling facilities that save him from fatigue.

These were the primary considerations that received careful study in designing the new factory unit. A major effort was made, for example, to eliminate needless physical exertion, by cutting down walking distances. To this end, car-parking areas were located just outside the stairwells. Locker rooms were placed in the center of each floor area, and at the work floor level instead of up some tiring steps to a mezzanine.

At the same time, the morale inspired by natural light and outdoor vision was sought in the building design. The realization of these and other objectives will be seen repeatedly in the following highlights of the new factory unit.

Building Construction

The new building is a three-story, steel-frame structure, with reinforced concrete floors, hollow tile walls, and a cream-colored, face-brick exterior. The ground floor, which is recessed below the grade level, has a continuous window strip of clear, double-glazed, wood ventilating sash at ceiling height. Sash panels are 2½ feet wide by 6½ feet long, bottom hinged.

The two upper floors have similar "vision" strips extending perimetrically from 4 feet to 6½ feet above the floor level. The outside wall spaces on these two floors be-

low and above the clear vision strips consist of light-directional, glare-diffusing glass blocks. The lower block space deflects incoming light to the floor, and the upper space deflects light to the ceiling. Light-colored, maple floors help preserve a balanced non-glaring illumination that does not strain the eyes as would a contrasting dark floor surface. Ceilings are white for high reflectivity.

Column spacing across the building width is significant. All column spacing on all floors along the building length is 25 feet. But not so the width. There is a narrow column spacing of about 16 feet (across width) on the ground floor. This does not affect any of its operations, which are mainly of a storage and service nature. On the first floor the spacing runs at intervals of 31-31-16-31-31 feet. This provides a long center core, 16 feet wide, in which are located the washrooms, locker space, and toilets. And it results in only one line of exposed columns on either side.

The column spacing on the second floor was made 62-16-62, thereby preserving the center core, yet also eliminating all exposed columns on this floor. This feature was made possible by the use of steel-truss roof spans, from which is hung the second-floor ceiling.

Ceiling Heights

Ceiling heights are 12 feet (ground floor), 14 feet 3 inches (first floor), and 14 feet (second floor). The entire interior wall surfaces of the two center-core sections, as well as of the six stairwells and other shaftways, are finished in light-green glazed tile. On the first floor the center-core section is a two-level enclosure that extends to the ceiling. The upper level (over the employee facilities) houses ventilating fans and plant service equipment for that floor. On the second floor, however, the center-core enclosure is only 8 feet high, leaving an open overhead space of 6 feet. This design creates a "mass" ceiling area that dispels the feeling of confinement and helps air circulation.

In the truss section above the second-floor hung ceiling is an attic service area which contains plant service equipment, telephone dial system, public address equipment, and time-clock center. The roof is of concrete slab construction, covered with a 2-in. layer of glass-wool blanket insulation, and topped with a built-up slag roof. The attic space also serves as a plenum chamber for the heating and ventilating units serving the second floor. It is equipped with exhaust fans regulated by pressure control.

Three automatic high-capacity elevators serve all floors. They are operated by remote control switches placed on columns about 30 feet from the shafts, for easy access by power-truck operators.

Employee Facilities

A locker for each employee—clean washroom and toilet facilities comparable to the best at home—all near the workplace. These were the goals fulfilled by provision of center-core type of space for employee facilities. Average travel to the nearest room is about 40 feet.

Each center core on both production floors is 16 feet wide and 450 feet long. Actually it is subdivided into six consecutive identical units, each about 75 feet long. On the first floor one unit in the center has been adapted to a modern and well-equipped first aid room, with doors actuated by an electric eye. On both floors the units can be easily rearranged for male or female workers in proportion to the concentration at particular floor areas.

Each unit consists of three rooms divided by 5-ft. open passageways extending clear across its entire width. Toilet rooms about 10 feet long are located at each end of a unit, and the combined locker and washroom, about 45 feet long, is in the center.

Sanitation facilities—urinals, waterclosets, and washbasins—are much beyond the state requirements. This cuts down employee waiting time materially. All rooms have tile floors and green glazed-tile walls to the ceilings, except for three rows of glass block at a 6-ft. height. Ceilings have noise-absorbent paneling and flush-mounted fluorescent lighting fixtures. Closets are individually partitioned.

Ventilation of these center-core units is obtained by forced circulation of air, in through ceiling distribution louvers in the washroom and out through ceiling grilles in the toilets. All toilet rooms are equipped with ultra-violet germicidal lamps for sterilizing the air, as also are the first aid station, conference rooms, and other meeting places. Ozone generators are used to prevent odors.

Along one length of a typical washroom is a continuous closed-front, stainless-steel washsink, 43 feet long, with 21 individual welded basins. Each basin is backed by a wall mirror. Integral in the sink unit are recessed paper towel dispensers at each basin, and spring-door openings to enclosed waste paper containers. Each basin has a foot-actuated pedal for furnishing pre-mixed hot water at 110 deg. F. A circulating heating loop and pump connected to the hot water tank assures an immediate and regulated supply.

Lockers are mounted on raised tile bases along the wall opposite the washsink. Greater capacity was possible through provision of separate clothes lockers and overhead shoe or hat lockers, in integral units, with sloping tops to prevent accumulation of refuse.

Drinking fountains are located in the center-core passageways and at other strategic places within easy walking distance. Two separate central-cooling systems with wall-type drinking outlets were adopted because they occupy less floor space and localize maintenance. They also use a circulating loop and pump (as in the hot water system) to assure a drinking water supply at a temperature constantly around 47 deg. F.

Production Areas

In production areas the major efforts were pointed to minimize fatigue and provide bodily comfort. All machines and equipment were painted light green to coincide with surrounding brightness levels. General lighting by overhead runs of intermittent fluorescent fixtures gives a minimum of 25 foot-candles at working levels. All work stations requiring higher intensities are provided with local fluorescent or spot lighting.

Clean, filtered air is furnished by a heating and ventilating system through ceiling outlets. In the winter, heat distribution is assured by zone control. Finned pipe radiation extends around the bottom of the outside walls to eliminate any chill from the glass sections.

Reduction of noise was provided on the second floor by a noise-absorbent ceiling because unusual concentration is often required of employees in assembling complicated apparatus. Pedestal riveters were mounted on felt pads to reduce vibration and noise. Hoists were placed at all operations where

heavy lifting occurs. Roller conveyors are used wherever possible for heavy transport between operations. Roller chairs allow sitting operators who serve several machines to roll quickly from one to another as needed.

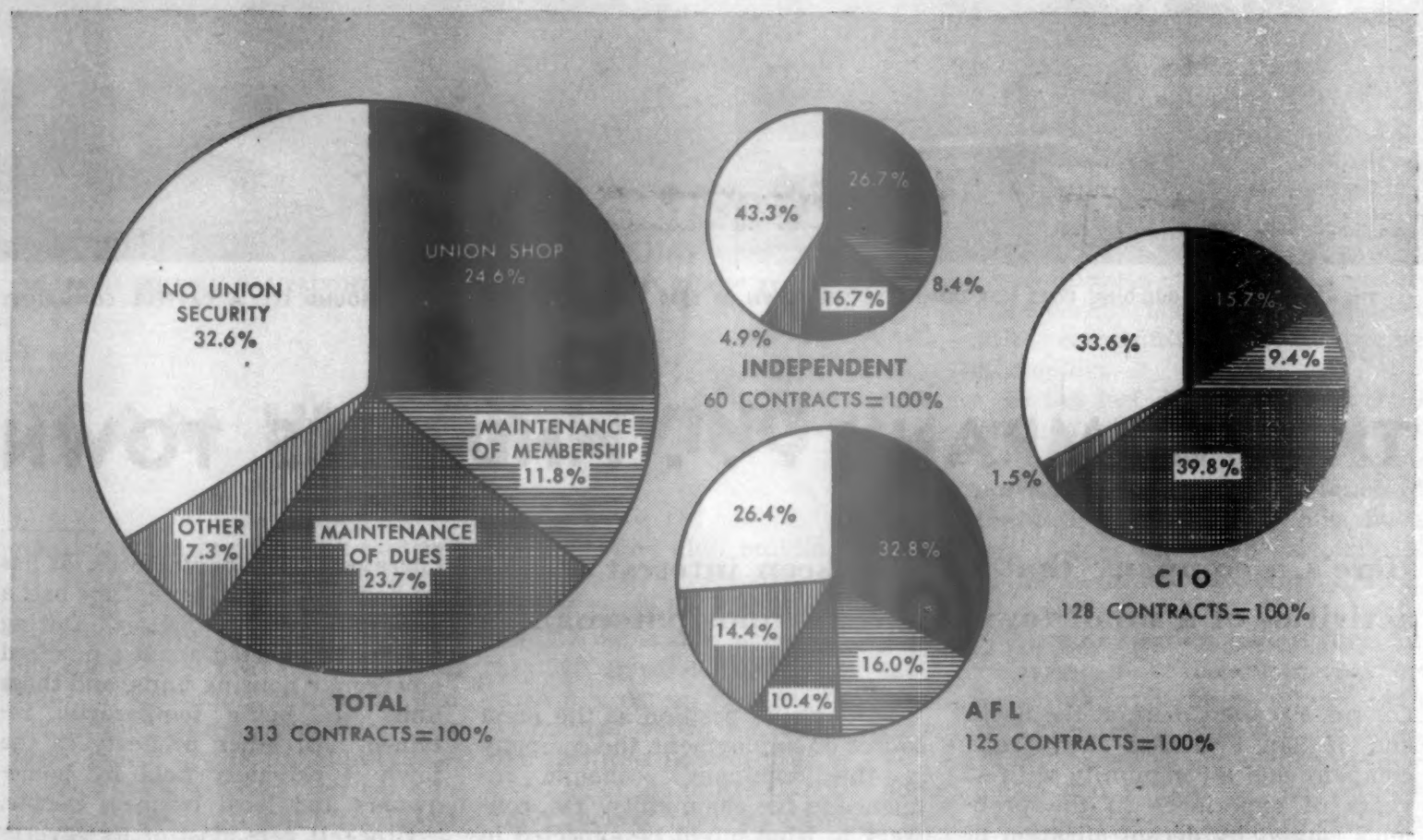
Service Equipment

The principle of centralization of plant service equipment away from production operations has been practiced wherever possible. In the attic space, for example, are found the dust collection units and motor-generator sets for various departments. Exhaust ducts are brought up through a pipe shaft from floors below to various separator units which vent through the attic roof. Thus hidden, these units are not an eyesore to mar the surrounding architecture.

Power and other service lines to machines on the production floors are connected from bus ducts and lines running at ceiling height of the floor below. This practice eliminates a maze of dropcords and pipelines, which not only present an untidy appearance but also cost more to install. Layout changes are easily made because of the special design of individual concrete floor panels. A templet of the steel reinforcement is available to locate riser holes without harming the panel. A special hole-boring machine grinds a hole through the floor in a matter of minutes. Old holes can be plugged to give original bearing strength.

UNION SECURITY UNDER THE TAFT-HARTLEY ACT

Provisions of contracts signed, Aug. 23, 1947, June 23, 1948



The following definitions are used in classifying the 313 contracts analyzed above:

UNION SHOP. Present and new employees must join union within specified period (not less than 30 days), and stay in for life of contract.

MAINTENANCE OF MEMBERSHIP. Present and future union members must remain in union for life of contract.

MAINTENANCE OF DUES. Employees agree, in writing, to check-off of dues for specified period.

OTHER. Includes 23 contracts of these types: CLOSED SHOP—workers must belong to union before employment (1 AFL); MODIFIED UNION SHOP—new workers must join union, old workers need not (6 AFL, 1 CIO, 2 Ind.); PREFERENTIAL HIRING—union members get preference (4 AFL); UNION HIRING HALL—employer must get new workers through union hiring hall (1 AFL); VOLUNTARY REVOCABLE MAINTENANCE OF MEMBERSHIP—workers can leave union during specified periods without losing jobs (4 AFL, 1 CIO, 1 Ind.); HARMONY CLAUSES—employer agrees to encourage unions membership without making it a condition of employment (2 AFL).

* * *

SOURCE: The National Industrial Conference Board's "Road Maps of Industry" Series. Copyrighted by the Board and reproduced with special permission.

THE C&H REFINERY BUILDING DOES NOT DOMINATE THE TOWN OF 5500 WHICH HAS GROWN UP AROUND IT. A CAREFUL COMMUNITY

THIS COMPANY . . . AND THIS TOWN

Here's a company that takes a keen interest in the activities of a small town and yet avoids paternalism

ON THE PACIFIC COAST, at the north end of San Francisco Bay, are a company and a community with 42 years of experience in the problems caused by decentralization of industry.

The company is the California & Hawaiian Sugar Refining Corporation. The community is Crockett, Calif., an unincorporated township of about 5500 people.

These two have been growing up together since 1906. During this period the company has learned much of what it may do to make the town a more attractive place. And the townspeople have come to know how much community help they may expect from the company.

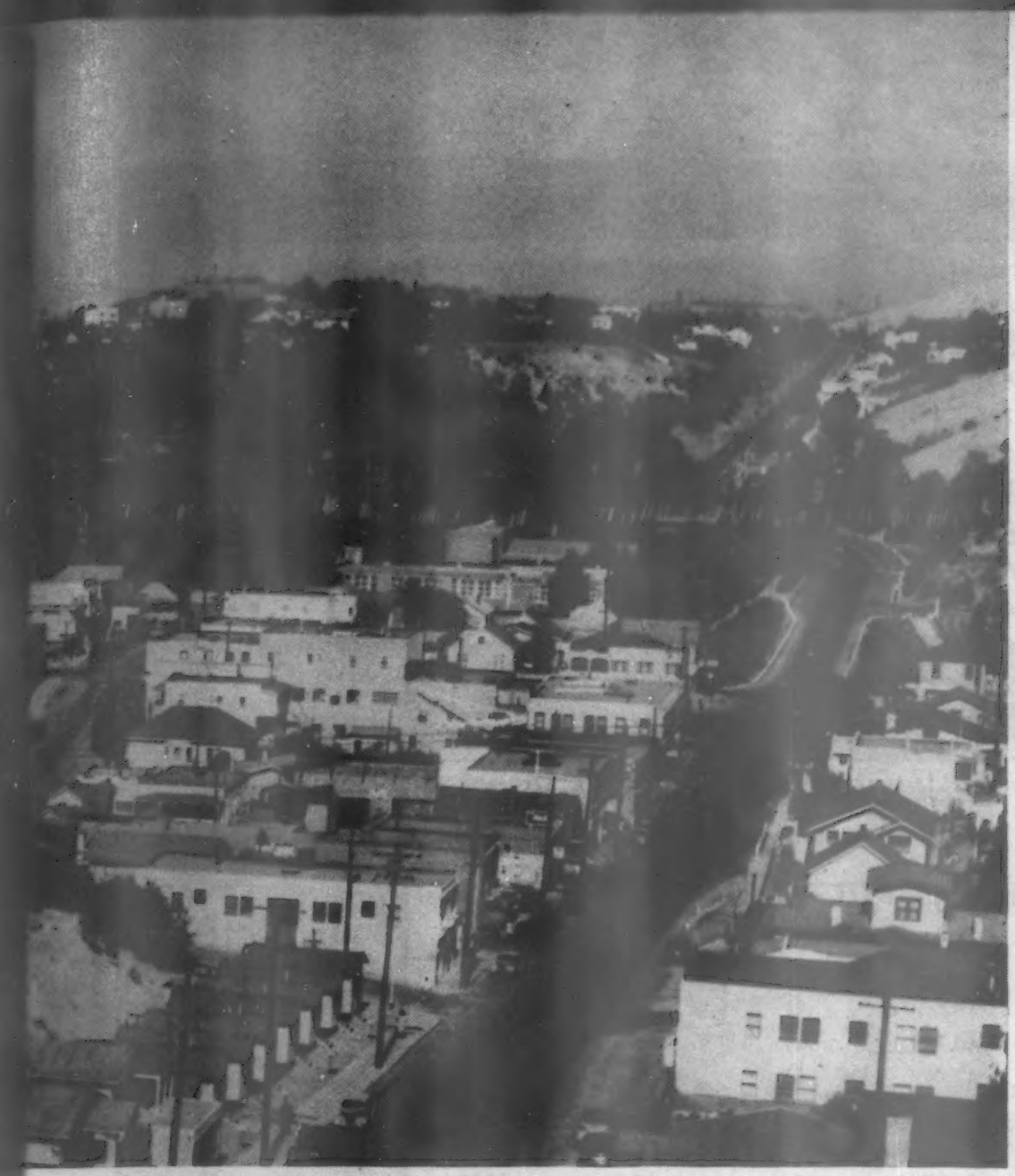
Through its position as the main source of employment, the company is the dominant economic influence in the community. Yet, contrary to what might be expected in a one-company town, the townspeople live their private lives with no more sense of company domination than if they lived out of town.

The result is a company-community relationship which establishes certain benchmarks that may help other companies decide how big a part they should play in community development.

Crockett is a one-company town. But it is not a company town in the usual sense. The sugar company operates no company stores. It has no homes for rent, except for half a dozen executives' houses. During the war, it erected about a hundred emergency housing units, and these units are being temporarily retained. All other property in the town is privately held by homeowners and local business people.

Crockett gets most of its governmental services from the county. A study made in 1936 indicated that the taxes necessary to support a municipal government would exceed the resulting decrease in county taxation.

To supplement these necessary services, the company has provided certain community services. They include three attractive parks, a large playground with two attendants, an athletic field, tennis courts, a community auditorium, a community club with a large swimming



RELATIONS PROGRAM HAS PREVENTED A FEELING OF "COMPANY TOWN" BY THE RESIDENTS

TEAM UP FOR LIVING

pool, a gymnasium, a youth canteen, buildings for boys' and girls' activities, and a building for the county branch library. The company also maintains the fire alarm system, hires a sanitation inspector, and augments police protection by night patrol of the community.

Back in 1906, when C&H came to Crockett, the town was a small and undeveloped settlement. The residents were apathetic about the new company. Earlier attempts to set up flour milling and beet sugar refining plants had failed.

As early as 1906, perhaps without realizing the direction it was taking, the company began its community program by trying to make the Hotel Crockett (torn down in 1940) the center of a more interesting community life.

Five years later C&H began to develop the first of the parks, playgrounds, and club buildings. They were so well received that when the company began a period of extensive expansion lasting from 1914 to 1922, it carried on at the same time a program of community development which included most of the facilities now in use.

Many of the things C&H has done for Crockett may be labeled "paternalism." Yet it seems evident that it has been an enlightened paternalism and adaptable to changing times. Certainly the two active labor unions in the sugar plant have never raised any objection to the community services provided by the company.

It is important to note that C&H has a sound record of industrial relations within the plant. The plant operates the year around. Wage levels are higher than in most of the sugar industry. The company has long had a plan protecting employees against loss of wages because of illness. Its retirement plan has been in effect for many years. Steady employment at good wages has had a tremendously stabilizing effect.

Under a home-ownership plan sponsored by the company, more than 200 homes have been built in the town by C&H employees. More than a fourth of all employees have been with the company for over 20 years. Normal labor turnover is small.

Annual Christmas Party

At Christmas each year the company gives a community celebration in which practically everyone in town takes part. This has been a tradition since 1911. There are gifts for all the younger children in town. There is a pageant in which local people take part. There are community dances. It all forms a spectacle that is evidence of genuine community spirit which depends in considerable part upon the interest the company has taken in the community down through the years.

The conclusion that may be drawn from the 42 years of experience between Crockett and C&H is that industry can benefit itself and its employees if it will, as conditions permit, take an active interest in the community life of the people it employs.

In the last decade or so a combination of labor union pressures and government activities of various kinds has discouraged much of the desire that industry may have had to take an active part in providing a fuller community life for its employees.

Yet now seems a logical time for management to re-examine participation in community affairs as a way of building employee good will. There seems to be plenty of evidence that enlightened community participation by industry will be welcomed by employees, because it is certain that labor unions and government agencies have not provided all the answers to a fully satisfying community life.

If the record of Crockett and C&H has any meaning today it is evident that a program of community activities, based on a sound understanding of human nature, is a dependable way for industry to demonstrate to employees that it is aware of them as human beings as well as workers.

1	2	3	4	5	6	7
Period in Which Plan Became Effective	No. of Plans	No. of Parti-cipants	Col. (3) as % of all Employees	Annual Payroll of Participants (in thousands)	Annual Employer Contributions (in thousands)	Col. (6) as % of Col. (5)
Prior to 1930	110	1,451,483	75.9	$3,266,567	$132,897	4.1
1930 to 1939	549	548,336	41.1	1,772,063	118,636	6.7
1/1/40—9/1/42	1,288	524,050	21.7	1,596,404	98,991	6.2
9/2/42—12/31/44	5,839	890,543	20.4	2,686,945	284,051	10.6
1/1/45—8/31/46	1,584	242,859	25.7	759,702	123,084	16.2
	9,370	3,657,271	33.3	$10,081,681	$757,659	7.5

Source: U. S. Bureau of Internal Revenue

TABLE I. Number, Coverage, and Cost of Approved Pension and Profit-Sharing Plans

	LOW ESTIMATE		HIGH ESTIMATE	
	Pensioners (thousands)	Payments (millions)	Pensioners (thousands)	Payments (millions)
1948[1]	7.0	$8	14.0	$17
1950[1]	13.4	16	21.4	26
1955[1]	26.6	32	41.5	50
1960[1]	40.8	49	63.3	76
1948[2]	40.7	$49	57.7	69
1950[2]	42.4	51	60.4	72
1955[2]	46.6	56	67.5	81
1960[2]	49.8	60	74.3	89
1970[3]	54.8	$66	89.7	$108
1980[3]	59.6	72	107.5	129
1990[3]	63.8	77	124.8	150
2000[3]	62.4	75	131.6	158

Source: Social Security Board

[1] Assuming only currently employed miners were eligible
[2] Assuming previously employed miners were also eligible
[3] Later years – same under both assumptions

TABLE II. Estimated Cost of Miners' $100-a-Month-at-Age-60 Pension Plan

	LOW ESTIMATE		HIGH ESTIMATE	
	Pensioners (thousands)	Payments (millions)	Pensioners (thousands)	Payments (millions)
1948	260	$312	536	$643
1950	505	606	811	993
1955	1,010	1,212	1,577	1,892
1960	1,531	1,837	2,388	2,866
1970	2,066	2,479	3,398	4,078
1980	2,250	2,700	4,056	4,867
1990	2,418	2,902	4,714	5,657
2000	2,357	2,828	4,974	5,969

TABLE III. Estimated Cost of $100-a-Month-at-Age-60 Pension Plan for All Manufacturing Industry

PENSIONS
Labor's Newest Target

- **On September 10 the first United Mine Worker pensioner got his first $100 check (See Table II on facing page for cost estimates)**
- **John L. Lewis has raised a big target for other unions to shoot at**
- **And shoot they will**
- **So—are we headed for $100-a-month pensions for all wage and salaried employees in all manufacturing?**
- **What would such pensions cost? See Table III (on facing page) for cost estimates**
- **What would be their effect on the economy?**

THERE IS TROUBLE AHEAD for management on pensions and other employee benefit plans. It stems from two recent developments:

1. The $100 monthly pensions at age 62 and the $100 million annual welfare fund won by John L. Lewis for his United Mine Workers.

2. Two NLRB decisions making employee benefit plans subject to bargaining with unions.

Lewis raised a big target for other unions to shoot at. He dramatized pensions and health and accident benefits, thereby arousing great desires for them among other workers. But more far-reaching—and likely to cause more trouble for management—is the convenient and timely assist given the trend toward union-bargained welfare programs by the National Labor Relations Board in the Inland Steel and W. W. Cross decisions.

For years, unions shunned welfare benefits, branded them paternalistic. Employers, on the other hand, put them into effect on their own hook, sometimes to resist unionization. When a union did get inside the door, it concentrated on wages, hours, and union security. Any benefit plans in effect were usually left to management control and discretion.

Now that is all changed. During the war, unions and even employers turned to so-called "fringe" benefits when the law would not allow a straight wage increase. These included vacations with pay, shift differentials, paid holidays, severance pay, and employee benefit plans that contained pensions and benefits covering sickness, accident, and death.

Two things happened during the war to stimulate this welfare trend:

1. The Internal Revenue Code, which allows legitimate, non-discriminatory employee insurance programs as deductible business expenses for tax purposes, was amended in 1942 to remove inconsistencies and difference in treatment between trust fund plans and insured plans.

2. The War Labor Board approved the installation of insurance plans whose cost did not exceed 5 per cent of payroll. In disputed cases it also ordered companies to include in the union contract any benefit plans previously established on a unilateral basis. If it did not do that, it usually barred the employer from making any changes in his benefit program during the life of the union agreement.

It was in this period, too, that Petrillo with his first royalties on phonograph records gave Lewis ideas. WLB said the royalties were not wages and thus not subject to approval under the Wage Stabilization Act.

Today unions not only want these benefit plans for their members; they also want them firmed up by their contract. And where such plans are not yet in the contract, they want a voice in any changes.

One union leader proclaimed a big victory in a recent settlement. The one point he won: Management agreed to make its employee insurance program part of the union contract.

Lack of union interest in welfare programs until recent years is shown by the fact that it was not until this year that NLRB had to decide whether benefit plans are "wages, hours, or other working conditions" on which, under the Taft-Hartley Act, as well as under the Wagner Act, management must bargain when requested. Yet the part of the law applicable has not changed since July 5, 1935.

The Inland and Cross cases both involve CIO steel workers. In the Inland situation, NLRB says the com-

pany cannot pension a group of 65-year-olds under its unilateral retirement program without bargaining the issue with the union. At Cross, a subsidiary of United Shoe Machinery Corporation, NLRB refuses to let the management put into effect a contributory group health and accident insurance program—the same one that is in effect at other subsidiaries—without negotiating with the union. The union wants a company-financed plan. All but two of the 355 Cross employees have agreed to participate in the corporation plan.

The situation created by these decisions is this:

Where there already is a union, the employer may not institute or make a change in a benefit plan without union approval any more than he can cut wages without it. This seems to be true whether or not the plan antedated appearance of the union in the plant and whether or not it is part of the union contract. Under the Taft-Hartley law, neither side of the bargaining table has to make a concession. This means, then, that this employer is stuck with his plan unless the union approves a change.

Where there is no union, the employer has free rein on his benefit plan—just as he has on his wages. But only until a union organizer shows up. Any changes made after an organizing drive begins may be construed as intended to coerce the workers against the union. Once the union gets bargaining rights, the employer's hands are tied.

Why Employers May Shy Away From Pensions

Management witnesses who testified before the Taft-Hartley watchdog committee expressed concern that many employers will shy away from pension plans for both the above reasons. Where there is a union, they do not feel it should have the right to participate in decisions with long-range effect which can be financially disastrous to an organization, particularly when it is bargaining on a year-to-year basis. Where there is no union, the employer will hesitate before involving his company in a benefit program because of the consequences that may follow once a union takes hold.

Unanimously, the employer witnesses were not opposed to plans for social benefits. All have had them for years. All bargain with unions. But they have not talked pensions or insurance plans with unions. They do not advocate the outlawing or curbing of these plans. They simply would nullify the Inland Steel and Cross decisions which thrust these issues into the give-and-take of collective bargaining.

Here is what T. S. Petersen, president, Standard Oil Company of California, told the watchdog committee: His company deals with 12 unions—CIO, AFL, and independent—and has not had a strike in 25 years. It has had a retirement plan since 1908, and has provided disability benefits and life insurance for 30 years. Of the 30 largest oil companies, 28 have formal pension plans—none of them negotiated with a union. Unions may raise threats to security of existing plans.

"The employer believes, and justifiably so," said Petersen, "that he alone can judge his capacity to meet large commitments, more especially those that bind him so far into the future."

Then there is the problem of competing unions, Petersen pointed out. In his organization, there are 12 of them. How can there be a meeting of minds on a single plan?

"Bargaining on pension plans is far from simple," Petersen says. "Proposals must not only be analyzed from the immediate effect upon the company, but must also be tested actuarially to determine their future effect. If the parties do not agree, there will be counterproposals, all to be analyzed in the same time-consuming manner. Eventually the tentative proposals must be submitted to the insurance company for its approval or rejection. If they are not in accord, the lengthy process must be repeated all over again. Finally, the matter must be submitted to the Treasury Department for its approval or rejection. It is an endless chain, disrupting to good employer-employee relations."

There are other factors. Bargaining on wages is different from pensions. Issues are clear. Results are immediate. And ability to pay is measurable to a large degree. Besides, the contract is binding only for its duration, usually only one or two years. If the situation changes, the contract can be changed. It is not that easy with pensions, where money must be set aside today to meet an uncertain contingency in the future. And who knows what new union with new ideas may come into the picture?

Petersen raises this question: *What is the bargaining test of whether an employer can or cannot afford to meet a pension demand?* Pension plans are not competitive; each must be cut to fit the company. Capacity to pay and cost of a plan differ from company to company. Costs are not constant, either. They are affected by changing interest rates, mortality experience, level of employee earnings, administration, and other factors. Among the most important are age, length of service, and size of pension.

If unions, through forcing unsound plans, raise the burden beyond the financial capacity of employers to support them, it would mean the loss to hundreds of thousands of workers of the old age security they now have or contemplate enjoying.

The Social Security Board estimates about 10 million workers in industry are covered by pension programs. A recent survey of the Bureau of Internal Revenue shows more than 3 million workers covered by plans it approved up to August 31, 1946. Since this figure applies only to the number covered at the time of approval, it obviously is low. (See Table I.) Note that in 9370 approved, the average annual employer contribution is 7½ per cent of the annual payroll of participants.

Bargaining on welfare benefits, which are conducive to corporation or industry-wide arrangements, also stimulates corporation or industry-wide bargaining. And where you have it on an industry-wide and pay-as-you-go basis—as in coal and electrical contracting—there is always a temptation for the government to bail the parties out if the plans fail. That is what happened in the railroads and brought into being the Railroad Retirement Act in 1937. Railroads and unions had to be pulled out of a hole.

There already have been suggestions that the government should take over the welfare program of the

miners. This possibility will become more real if production of coal drops and the royalty payments into the fund become smaller while demands on the fund increase.

An actuarial firm and the government's actuary have agreed that the 10-cent-a-ton payments into the mine workers' fund would not support $100 monthly pensions, plus other benefits due the miners.

An important point to remember about the miners' pension—one that Judge Goldsborough cited in refusing to enjoin the plan—is that it is tentative and subject to change as experience dictates.

Table II shows two estimates made by the Social Security Board of the cost of miners' pensions over the years. The difference between the low and high estimates represents different assumptions on mortality rates, economic conditions, and the number of miners who would retire.

Dorrance C. Bronson, actuary for the Wyatt Company, actuarial consultants, considers most significant the magnitude of payments for later years in relation to payments for early years. He points out that the rate of benefit outgo would go up fivefold or sixfold if only "current employed miners" were eligible.

As coal production drops in later years, the amount of the royalty will have to be increased or the benefits reduced.

What Pensions For All Industries Might Cost

All this raises the question: *What would similar pensions have cost if they had been provided for all wage and salaried employees in all manufacturing?*

Exact figures are not available. The Social Security Board could not supply them even for the coal mining industry. The best it could do (see Table II) was come up with estimated minimum and maximum costs. From these two estimates, however, it is possible to compute probable costs of extending the UMW plan to all industry. Results are shown in Table III.

It should be explained that when the Security Board was asked to estimate the cost of the UMW plan, Lewis was shooting for a 60-year retirement age. So both Tables II and III are based on that figure. Also, in extending the Security Board estimates it had to be assumed that the ratio of pensioners to total employees would be the same in all manufacturing as in coal mining, and that only currently employed workers would be eligible.

With that reasonable assumption, then, Table III was constructed. Note that payments under the *low* estimate begin at $312 million for 1948, rise sharply to six times that figure by 1960, reach $2.5 billion in 1970, fall just short of $3 billion in 1990.

The cost is inside 7.5 per cent of payroll (which is the average cost shown in Table I). But now look at the *high* estimate. Here, payments begin with $643 million in 1948, reach $4 billion in 1970, continue up to $4.8, $5.6, and $5.9 billion in 1980, 1990, and the year 2000. Translated into percentage of current payroll, payments are thus on the order of 9.3 per cent in 1970, 11.3 per cent in 1980, 13 per cent in 1990, and 14 per cent in 2000.

And that is not all. Were industry to assume this burden, the bulk of it would have to be passed on to the ultimate consumer in the form of higher prices. That in turn would mean still higher wages, and still higher prices. It would contribute to a wage-price spiral. Would the economy be able to "take it"?

Many old-line unions have their own pension plans. The AFL International Brotherhood of Electrical Workers started one in 1927. The member paid 40 cents a month and got $40 monthly pension at age 65 after 20 years. The National Electrical Contractors Association felt compelled to come to the rescue last year when IBEW fund was running in the red. It is asking electrical contractors—whether NECA members or not—to kick in 1 per cent of payroll. From this, NECA matches the contributions of the IBEW members into a fund from which are paid $50 monthly pensions, at age 65, to all IBEW members with 20 years' service. Right now, there are 3000 pensioners, and the number is expected to increase about 400 a year.

Some doubt has been raised whether the pension can be supported by the present contributions to the fund. The contractors feel safe because they are committed only to match the amount kicked in by the union members. How this will stand up when employment falls off, is problematical. In one expert's opinion, the contractors' contribution would have to go up to as high as 5 per cent to keep the pension fund solvent in later years.

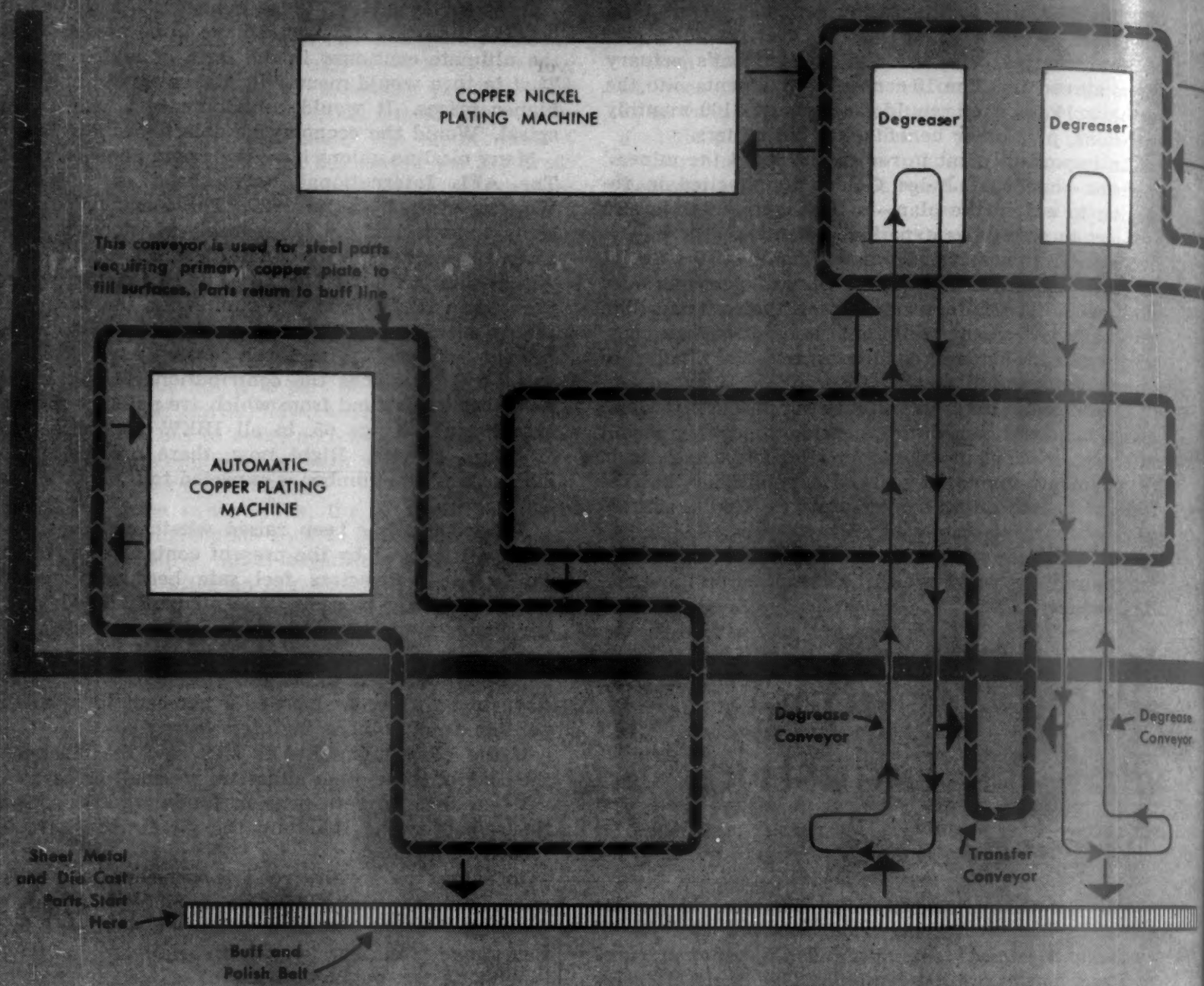
If the government has to step into the electrical, the coal, or some other situation, we shall be creating a lot of little private pension funds while trying at the same time to build up the government's social security system.

In short, the royalty road to pensions is a rocky one. There are many dangers lurking which can be disastrous to the employer who gets involved in a long-range plan that is not actuarially sound.

What is the outlook, then?

For any change in the NLRB policy, we must look to the courts and Congress. The Board itself backed the policy by a 4-1 vote, so is not likely to reverse itself soon through membership turnover. The Inland and W. W. Cross decisions are under appeal, so the courts may upset them. That is not a good bet, however. There is a chance that Congress may step into the situation next year. The watchdog committee may recommend a change in the Taft-Hartley law to remove benefit plans as a subject for compulsory bargaining. And Congress may make that change.

There is also a feeling that employers will hesitate to get involved in benefit plans—if they do not already have one—if they must bargain with a union, now or at some future date, on the plan itself, and later on any changes. Thus the employer without a plan can hold out against one although he must discuss the matter with the union. On the other hand, the employer with an existing plan is stuck with it unless he drops it long before a union enters his plant. He can not change or drop it without union consent. And the union, too, can refuse to make a concession. In this kind of situation, however, such refusal would leave the employer stuck with a plan which, for reasons best known to him, might need revision. Such a situation would hurt the workers in the long run.


PLATING DEPARTMENT LAYOUT
COPPER NICKEL PLATING MACHINE
Degreaser
Degreaser
This conveyor is used for steel parts requiring primary copper plate to fill surfaces. Parts return to buff line
AUTOMATIC COPPER PLATING MACHINE
Degrease Conveyor
Degrease Conveyor
Transfer Conveyor
Sheet Metal and Die Cast Parts Start Here
Buff and Polish Belt

CADILLAC'S REDESIGNED LAYOUT IN THE PLATING DEPARTMENT MADE POSSIBLE THE INTRODUCTION OF EIGHT CONVEYORS INTEGRATED . . .

HIGHER OUTPUT FROM NEW LAYOUT

C. A. RAFTREY • WORKS MANAGER, CADILLAC MOTOR CAR DIVISION, GENERAL MOTORS CORPORATION, DETROIT

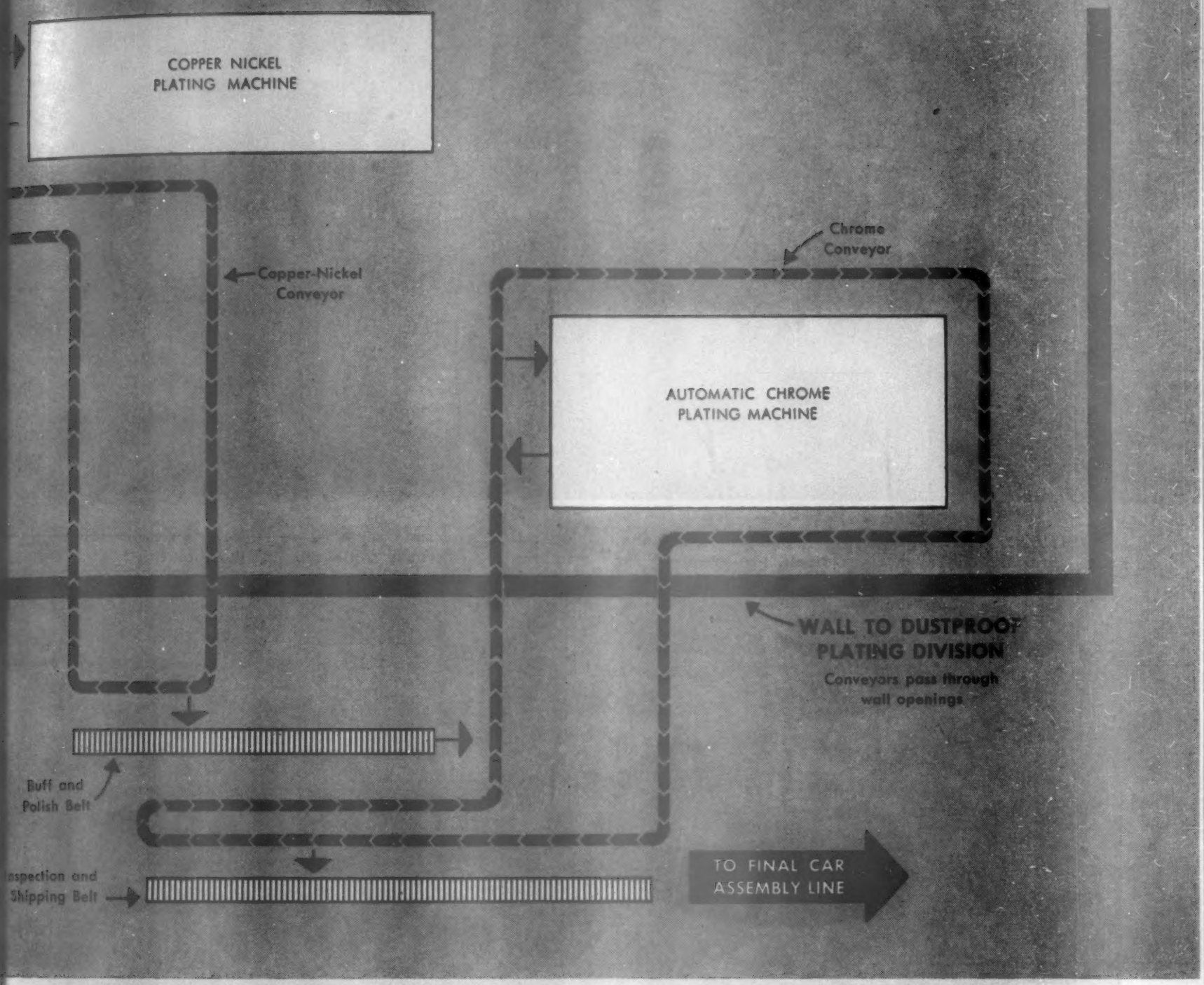
MACHINES, CONVEYORS, AND LAYOUT work together to reduce costs and make work easier in the new polishing and plating department at the Cadillac Division.

Production has been increased substantially. Unit costs are in a downward trend. Worker efficiencies are on the upgrade. And the cost of handling has been reduced appreciably.

It all adds up to an integrated production system with conveyors carrying materials, automatic machines doing the work, and a layout that forces materials to flow.

OLD METHOD

With the old layout and machinery, most parts were hand plated. Quality of the final product depended entirely upon the worker's skill and his interest in the job. Parts were moved on trucks from one operation to another—there was no planned conveyor system.



. . IN A SINGLE SYSTEM WHICH PROVIDES COMPLETELY MECHANIZED HANDLING OF PLATED CAR PARTS THROUGH AUTOMATIC OPERATIONS

AND BETTER HANDLING

As a result—costs were excessive; operator fatigue was high; and production was low.

To achieve "controlled plating," minimize handling, make work easier, and increase production, the plating division was completely revamped. Formerly, the plating department was located on the fourth floor over 3000 feet away from the final car assembly line. Materials had to be hauled long distances and elevators were overburdened.

The first step was to move the department closer to the final car assembly line. Now, as finished parts feed off the final inspection line they have to be moved a little over a 100 feet to reach their point of assembly in the final automobile.

NEW METHOD

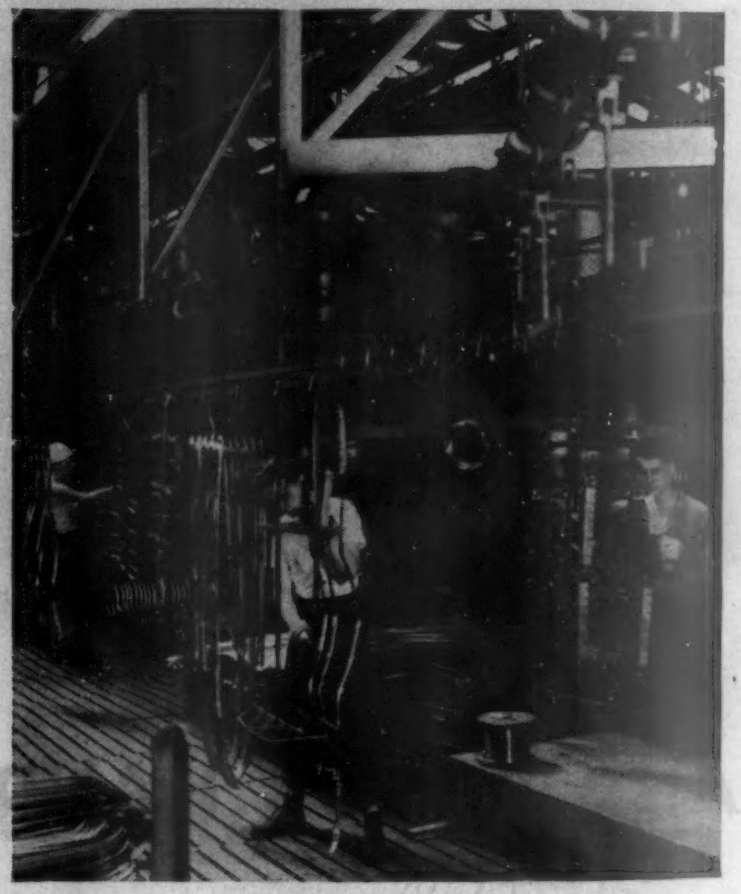
Conveyors. An integrated conveyor system was developed to minimize handling within the department. Now workers have only to place parts on conveyors .and take them off.

All parts are handled on these conveyors except wheel disks, bumper guards, and others that require special attention during one or more of the buffing and polishing operations.

The conveyor system consists of five separate power-driven over-

POLISH AND BUFF operations are performed by hand. Parts enter by conveyor from stock, are removed for operation, and then replaced on belt. Belt carries them to transfer conveyor to degreaser before plating

AUTOMATIC MACHINERY makes for lighter work, more uniform results, and dust-free air in buffing room



TROLLEY RACKS permit hanging of maximum number of parts and still insure positive plating at all points

head chain lines and three separate power-driven belt lines, as follows:

1. First polish and buff belt line for sheet metal and die cast parts.
2. Two overhead chain conveyors for degreasing parts before plating.
3. Overhead "transfer" conveyor to carry parts from the degreaser to copper and nickel lines.
4. Overhead chain line for copper plating sheet metal parts only before final buffing and copper-nickel plate.
5. Continuous overhead conveyor to carry parts from transfer conveyor to automatic copper-nickel plating machines and then to copper-nickel polishing line.
6. Power-driven belt line for copper-nickel polish and buff.
7. Final chrome plate overhead conveyor which carries parts from the buff and polish line to automatic plating machine and then to final inspection line.
8. Final inspection belt line.

All conveyors were planned to

RACK TRUCKS of special design transport certain parts through polishing and buffing operations. Capacity is five times that of older trucks

FINAL INSPECTION takes place after chrome plating operation. Glareless, high-intensity light is provided by special reflecting canopy

serve as "traveling stockrooms" during processes, practically eliminating floor float of parts. Parts are either in process, on the float conveyor lines, or at the final car line ready for assembly. Conveyors dip at loading and unloading stations to minimize the amount of reaching for the worker.

Automatic Machinery. Hand-plating methods were outlawed and replaced with automatic machines. Skill has been transferred from the worker to the machines—which assures high-quality plate.

For many of the polishing and buffing operations, both semi- and fully automatic machines have been installed. These machines are practical only for high-volume parts, such as bumper guards and wheel disks.

These machines have proved to be a valuable aid toward reducing costs, making work easier for the worker, and increasing production. Before, more than 17 different plating operations had to be performed by hand. Now only one is required, and that is on parts with peculiar contours that prevent efficient racking and plating by automatic methods. Even these parts are handled between operations by the conveyor system.

Ventilation. Workers in the polishing and buffing section no longer have to wear nose filters to prevent inhaling dust and other foreign matter. A ventilation system was designed to pull air through the department and to exhaust dust and dirt individually from the many polishers and buffers. The air is pulled through the overhead ventilators, given a water wash to remove dust and dirt, and then recirculated without any heat loss. Fresh air from the outside is proportionately mixed with the recirculated air.

The polishing and buffing section is separated from the plating section by a ceiling-high wall. Conveyors feed back and forth from these two divisions through holes in the wall. The plating room is maintained under constantly controlled pressure. Air can filter out through the cracks and holes used by the conveyors, but none of the dirty or dusty air from the polishing section can enter. Thus contamination of plating solutions is prevented.

The Process. All steel parts are polished on special abrasive wheels to obtain a smooth surface. After the polishing operation, the parts are given a primary copper plate (the copper conveyor line is used only for steel parts, others feed directly through the conveyor system as shown on the flow diagram).

After the copper-plated steel parts and die-cast parts have been buffed, they are degreased. They then ride the transfer conveyor to get, in succession, a copper and then a nickel plate. From here the parts feed to the nickel buff line and then to final chrome plate. After chrome plating all parts must pass a rigid inspection before being okayed for final assembly.

WAGE INCENTIVE PRACTICES IN 96 PLANTS

Two years ago, FACTORY commissioned Stephen Havasy & Company, management consultants, Chicago, to survey industry's wage incentive practices in the immediate post-war period. The results, based upon 65 plants reporting, were published in September, 1946. The outstanding fact disclosed at that time was the trend toward the standard-hour incentive plan.

To test possible changes in the 1946 pattern, FACTORY gave the Havasy group a special assignment to repeat the survey. This year, 95 plants responded. This is what their reports indicate:

The trend to the standard-hour incentive continues—and the over-all (plant-wide) bonus is gaining favor, especially in small plants. Fewer companies are changing plans now as compared to 1946. The trend to more extensive use of standard time data and to more precise labor standards continues. Far more extensive use is being made of labor standards for cost purposes than in 1946.

Survey coverage

In terms of companies, plants, and employees, this survey covers:

NUMBER OF COMPANIES	93
NUMBER OF PLANTS	
GROUP I: Metal parts; assemblies and machines; assemblies made from metal and other materials, such as pens, pencils, and musical instruments	67
GROUP II: Steel; sheet metal and tubing; paper and paper products; rubber, plastics, and leather; chemicals; non-ferrous metals	29
TOTAL NUMBER OF COMPANY EMPLOYEES	221,893
NUMBER OF PLANT EMPLOYEES	
Productive	76,795
Non-productive	62,178

Unions

QUESTION: Does the union participate in the time study or rate setting procedure?

	UNIONIZED PLANTS 1946*	1948
GROUP I		
Up to 400 employees	10%	17%
401 to 850 employees	20	18
851 to 1850 employees	23	14
Over 1850 employees	50	43
All Group I plants	33	32
GROUP II	33	

** The 1946 figures are for both Group I and Group II plants, since no comparable clarification was made in the earlier survey.*

QUESTION: Does the union participate in the job evaluation procedure?

	UNIONIZED PLANTS 1946	1948
GROUP I		
Up to 400 employees	56%	30%
401 to 850 employees	40	50
851 to 1850 employees	65	70
Over 1850 employees	75	50
All Group I plants	58	50
GROUP II	33	

QUESTION: Do you anticipate more participation in the near future by the union in your plant as far as time study and/or job evaluation procedures are involved?

	1946	1948
Yes	40%	21%
No	57	73
No opinion	3	6

Wage plans

QUESTION: As far as productive employees are concerned, which plan of wage payment do you now use in calculating gross pay? If more than one plan is used, indicate approximate number of employees on each plan.

COMMENT: Out of 96 plants, 38 use more than one wage plan. Of these 38, 2 use 5 plans; 5 use 3 plans; and 31 use 2. Of the 38, all except 5 plants use straight daywork as one of their plans. Of the 12 plants using over-all bonus plans, 10 pay in one way only, 2 pay in more than one.

The 96 plants use a total of 145 plans as follows:

	PLANTS	PER CENT
Straight daywork	67	70
Piecework	26	27
Standard hour —100% premium	23	24
Over-all bonus—based on total production or profits, whether paid weekly, monthly, semi-annually or annually. (Do not include pension, annuity, health, and insurance plans)	12	13
Measured daywork	7	7
Standard hour—less than 100% premium	6	6
Point or unit	4	4

In the 1946 survey, the question was worded as follows: "Which plan of wage payment do you use in calculating gross pay for the greater part of your productive employees?" Because of the change in wording, results of the two surveys on this question cannot be compared.

QUESTION: Have you during the last six months changed any of your wage incentive plans? Do you contemplate changing any of your wage incentive plans during the next 12 months?

COMMENT: Eighteen of the 96 plants changed or are changing wage payment plans. Fewer companies are changing than in 1946. There is no significant difference between Group I and Group II.

	1946	1948
Per cent changing	33	19

Changes during each of the two years were made *away from* the following plans:

	1946	1948
Straight daywork	55%	50%
Piecework	30	11.1
Standard hour—less than 100% premium	10	5.6
Standard hour—100% premium	5	5.6
Over-all bonus plans	0.0	11.1
Measured daywork	0.0	11.1
Point or unit	0.0	5.5

Changes during each of the two years were made *to* the following plans:

	1946	1948
Standard hour—100% premium	45%	38.9%
Standard hour—less than 100% premium	5	0.0
Piecework	20	16.6
Measured daywork	15	5.6
Over-all bonus plan	5	22.2
Point or unit	0.0	5.6
Undecided	10	11.1

CONTINUED ON NEXT PAGE

Pay range

QUESTION: What are the total financial earnings of an average productive employee on incentive, expressed as a percentage of straight time base pay?

COMMENT: Answers to this question range from 102 to 165 per cent, with an average of 124.4 per cent. For each type of wage payment plan the ranges are as follows:

	RANGE	AVERAGE
Piecework	118 to 165%	135.7%
Standard hour—100% premium	102 to 142	118.4
Standard hour—less than 100% premium	121 to 130	120.4
Point or unit	120 to 145	129.0
Over-all bonus plan	106 to 145	119.5

Standards

QUESTION: What percentage of your labor standards are determined in each of the following ways?

COMMENT: Because many companies were unable to approximate the quantities or percentages, the analysis is based on the way in which each plant determines *the greater portion* of its standards.

	PER CENT OF PLANTS GROUP I	GROUP II
Estimated	6.9	9.1
Past performance records	15.5	22.7
Standard time data	24.1	9.1
Individual time studies	53.5	59.1

●

QUESTION: Have you recently changed, or do you anticipate changing, the method of determining the greater portion of your labor performance standards?

	PER CENT OF PLANTS GROUP I	GROUP II
Yes	52	33
No	48	67

Changes are reported as follows:

	PER CENT OF PLANTS FROM	TO
GROUP I		
Estimated	29	4.2
Past performance records	12.5	8.3
Standard time data	12.5	54.2
Individual time studies	46	33.3
GROUP II		
Estimated	25	0.0
Past performance records	50	25
Standard time data	0.0	25
Individual time studies	25	50

●

QUESTION: Have you recently changed, or do you intend changing, your time study techniques?

	PER CENT OF PLANTS 1946*	1948
GROUP I		
From more precise to less precise methods	5	0.0
From less precise to more precise methods	45	38
No change	50	62
GROUP II		
From more precise to less precise methods		4.8
From less precise to more precise methods		23.8
No change		71.4

** The 1946 figures are both Group I and Group II plants, since no comparable classification was made in the earlier survey.*

HERE IS A COST-REDUCTION PROGRAM FOR THE SMALLER COMPANY

EMERY W. COOK • DURO-TEST CORPORATION
NORTH BERGEN, N. J.

FOR THE SMALLER COMPANY that wants to cut its costs, why not set up a committee to do the job? That is the method we chose at Duro-Test Corporation.

We chose the committee attack, and we recommend it because in the first year of its life a cost committee has served to reduce material spoilage 60 per cent. Labor efficiency has improved about 20 per cent. Reduction of unit cost has amounted to 10 per cent.

Membership of Cost Committee •

Membership in the cost committee has been extended to the chief product engineer, company treasurer, chief cost accountant, manager of equipment and design, production manager, and the superintendent of each operating department.

Functions of Cost Committee •

Principal function of the cost committee has been to review the company's efficiency cost reports for the previous month of operation. It studies each operating division and considers its efficiency. Concern of the committee extends to material, labor, and machines.

Only broad aspects are covered. Selected areas of difficulty are referred to one of two subcommittees, or back to the operating department head, if the cause of high cost is improper supervision.

Subcommittee on Equipment •

Organized chiefly to consider long-range cost reduction, this committee consists of the equipment manager, chief engineer, production manager, and departmental production heads.

It concentrates upon how to reduce costs through selection and acquisition of faster, more efficient machines. Often accepting suggestions and recommendations of the cost committee, it uses engineering, design, and production know-how to correct each problem where possible. When a solution to a problem involves a large capital expenditure, it presents its case to top management. It deals in dollars and cents, and when management agrees that long-run savings will be accomplished, this committee initiates the process of machine design and construction.

Subcommittee on Cost Reduction •

Consisting of divisional product engineers, chief cost accountant, purchasing agent, and departmental foremen, this group analyzes month-to-month cost variations. It also studies items delegated to it by the cost committee for correction and improvement.

A habit of this group is to delve as deeply as possible into all details contributing to any particular deficiency or high cost. An early discovery was the necessity for careful and detailed follow-up of all problems.

The cost-reduction group concerns itself only with improvement of existing methods and product design refinements which lead to cuts in material and labor cost. Those closely associated with direct production operations are generally appointed to recommend and effect correction.

A very definite itemized account of all changes made is kept by this committee. It shows the saving per year made through its efforts and serves to stimulate the group.

Administration of Committees •

When the two subcommittees have studied their respective problems, one man is selected by the group for direct responsibility for action. His name and the estimated project-completion date are entered in the minutes of the meeting. Each member of the committee receives a copy of the minutes. Those with assignments receive memoranda from their superiors reminding them of their responsibilities.

To keep the cost committee humming with productive activity, conferences are held monthly without fail. Meetings are conducted along a definitely determined pattern. Chairman of both the cost committee and the equipment committee is the production manager; chairman of the cost reduction committee is the chief cost accountant.

To balance the personal responsibility placed upon its members, the cost committee takes particular care to extend personal credit to each member for a satisfactorily completed project.

One example of the fruits borne by the committee approach to the cost problem is noted in results obtained from the drive instituted by the cost committee against unreported material loss. Obviously, material spoilage cannot be controlled if such loss appears only as a difference in monthly inventory records. Our first effort was directed to force these unknowns out into the open by detailed accounting for all materials received, used, and lost as defective. Particular emphasis was placed on carefully tabulated reasons for such defects. The cost committee followed this up with another allocation of responsibility for correction of such defects. Results have shown a decrease in unreported loss of approximately 40 per cent. There has been a simultaneous improvement in material efficiency of 6 per cent.

One pleasing result of efforts by the equipment committee has been the complete mechanization of a former hand operation that had been selected by the cost committee for close scrutiny. Before action started, the operation required direct labor expenditure of approximately 8500 hours yearly. Now, nearly all the man-hours previously expended have been saved, with a resulting drop in unit cost.

In this case, the cost committee reviewed the cost of each operation and collectively asked itself: Can anything be done to reduce the cost of this operation? What will it cost? How much will it save yearly? With the answers to these questions available, approval for capital investment was obtained, and proper action was taken.

RATIO DELAY TIME STUDY SHEET

DATE 5/2/48 OPERATION TURN HEAD, SEAT AND UNDERCUT

TOOL MATERIAL
LUBRICANT
R.P.M.
F.P.R.
DEPTH OF CUT

REMARKS	DATE	TIME	RUNNING	REASON FOR DELAY: ROUGH O.D. TOOL	FINISH O.D. TOOL	SEAT TOOL	BREAKEDGE TOOL	UNDERCUT TOOL	ADJUST MACHINE	REPAIR MACHINE	MISCELLANEOUS	AVOIDABLE
	5-2	7:53A	✓									
		8:40	✓									
		9:25	✓									
CHANGE		10:56		✓								
		11:15	✓									
ADJUST COLLET		12:35P							✓			
REMOVE CHIPS		1:07									✓	
		1:35	✓									
		2:02	✓									
ADJUST		2:48				✓						
		3:41	✓									
		4:08	✓									
		4:32	✓									
		5:08	✓									
CHANGE		5:36				✓						
		6:38	✓									
		8:15	✓									
REPAIR SPINDLE		8:40								✓		
" "		9:13								✓		
FEEDER NOT AWARE MACH. WAS OK		9:47										✓
		10:22	✓									
		10:49	✓									

1. Recording delays, when using the ratio method, does not require timing of the actual delay

USING RATIO DELAY STUDIES

J. S. PETRO • STAFF INDUSTRIAL ENGINEER, THOMPSON PRODUCTS, INC., CLEVELAND

AN IMPROVED METHOD of determining allowances for delays incidental to the performance of work has reduced the cost of such determination by 60 to 70 per cent at Thompson Products.

To set accurate standards, regardless of the purpose for which they are intended, it is necessary to make allowances for delays incidental to the performance of work. The length and occurrence of these delays are usually unknown. To determine them accurately, it is necessary to make a "delay" study over a considerable period of time.

Stopwatch delay studies are expensive. A single study may tie up a man for days or weeks. During that period he may not be interrupted without affecting the results of the study. Such a study, in addition to being a monotonous procedure for the time study man, does not give a true recording of the natural working routine of the op-

COMPARISON OF RATIO DELAY AND STOPWATCH METHODS

	RATIO DELAY STUDY		17,000 MACH MIN STOPWATCH STUDY	COMPARISON OF METHODS
	NUMBER OF OBSERVATIONS	% OF RUNNING OBSERVATIONS	% OF RUNNING TIME	% DEVIATION
RUNNING	1691			
TOOL DELAY (5 TOOLS)	199	11.8	11.5	2.6
ADJUST MACHINE AND MISC.	80	4.8	4.7	2.1
MACHINE REPAIR	183			
AVOIDABLE	57			
TOTAL	2210	16.6	16.2	2.5

2. Variation of ratio and stopwatch methods is within range of normal error for delay times

DELAY ALLOWANCES DETERMINED BY TWO RATIO STUDIES

	RATIO STUDY	
	RATIO STUDY	STOPWATCH STUDY*
ROUGH O.D. TOOL	2.9	3.0
FINISH O.D. TOOL	2.2	2.3
SEAT TOOL	4.2	4.0
BREAKEDGE TOOL	1.1	0.9
UNDERCUT TOOL	1.8	1.3
ADJUST MACHINE AND MISC.	5.0	4.7
TOTAL	17.2	16.2
FACE TOOL	3.1	
CENTER DRILL	0.5	
TOTAL	20.8	

*** These figures are no longer used, and are shown here for comparative purposes only**

3. Allowance for combination of less than seven tools can be set by subtracting from total

TO SET ALLOWANCES

erator because of the pressure under which he performs his duties during this constant observation.

Because of the expense involved and the time consumed, it is frequently found impossible to assign observers to delay studies as there are often more urgent demands on their time. The result is that many studies are postponed or neglected, and delay allowances are based on judgment alone.

During the past eight years approximately 25 per cent of our time study personnel have been assigned to the determination of delay allowances. This was accomplished by stopwatch studies, which consisted of continuous observation of the operation in question. Such observation usually continued until sufficient data had been accumulated to measure accurately the time lost through unavoidable delays and interruptions during the period of a normal or average working day. Although the length of the study generally depended on the type of operation, at no time—regardless of the operation—was there less than one full shift of observation.

Observation was not limited to predetermined elements. Each item was recorded when it occurred and in the sequence in which it occurred. Such observations were then

carefully analyzed, and the final step is the calculation of the allowlowances for unavoidable delays and interruptions.

Comparative studies made in Thompson plants have now thoroughly convinced us that stopwatch delay studies may be eliminated by using the "ratio delay" method.

The ratio delay study consists of the recording, at random intervals, the status of a machine—whether it is running or idle. If a sufficiently large number of recordings are made, the percentage of the total "idle" recordings of the machine tend to equal the percentage of time that it is actually in that state.

The following principles govern studies conducted by the ratio delay method:

1. Only homogenous groups should be combined in a single study; that is, similar operations on similar machines.

2. Fewer than 1000 observations are of little value. Best results are obtained in the range from 2500 to 3500 observations.

3. Observations must be made at random intervals, sufficient time being allowed between observations to give independent readings.

4. Observations should be made throughout all hours of a working day, and over a period of not less than two weeks.

To determine the relative accuracy and time consumption of stopwatch and ratio delay studies, both techniques were applied at different times to a group of six 6-spindle 1¼-in. automatic machines. Each machine had five cutting tools. Each was performing the same series of operations on the same part.

A 17,000 machine-minute over-all stopwatch time study was the first completed.

For purposes of consistency the "reasons for delay" used as a basis for the ratio delay study which followed were taken directly from the observations made during the stopwatch study. These "reasons for delay" were recorded on a ratio delay time study check sheet (Figure 1). On these sheets the time study men were required to record the status of the machine at the time at which they were directly in front of the machine. Each man was instructed to make a separate observation each time that he passed the group of machines on his way to take a time study, and also when he was returning to the office. Observations were also to be made within the hour of the start and end of each shift.

On the form, observations were indicated by a check mark in the column which most nearly described the status of the machine when the observation was made. At the time of the observation, if the machine was found to be idle, the specific reason for such idleness was noted in the "remarks" column.

Following each day's recordings, the observations for each machine were totaled and posted to accumulated data sheets for the machine and for the entire group of machines. This step gave a daily check on the progress made over the study period of three weeks.

Comparison of Methods

At the end of the first ratio delay study, a comparison was made between the stopwatch and ratio delay results for both tool and miscellaneous delays (Figure 2). The item of machine repair was not included in the per cent of delay allowance, as repair work is performed by maintenance employees and the operator is assigned for the duration to another job.

As may be seen from the chart, the difference in the total allowances of the two methods was only 2.5 per cent, or within the operating error inherent in either method.

Because of lack of faith in the results of the first study, stemming from a seemingly "too close" agreement between the two methods, a second ratio delay study was made on another group of six similar machines performing similar operations. The only difference was that each machine in this second group had two additional cutting tools. In this study, which covered a four-week period, these two additional tools were recorded separately so that results could be compared with the original study.

Again the results showed close agreement with original over-all stopwatch time study. The weighted results of the two ratio delay studies were accepted as the delay allowance for the operations on these two groups (Figure 3).

There are a total of ten groups of 1¼-in. 6-spindle automatic machines, ranging from four to eight machines in a group, performing similar operations on the same product. The cutting tools on these machines are interchangeable, but the number of tools per machine may vary from a minimum of four to a maximum of seven. Three basic tools are used on all jobs. The remaining four tools may be used in any combination.

Following completion of the studies on the first two groups, there remained eight groups of similar machines on which delay allowances had to be set. The only variable was the combination of types and number of tools. Because of this, it was possible to use the data from the two original ratio delay studies to set allowances for all machines, making adjustments for the different types of tools used. Figure 3 shows the allowance indicated for the various types of tools by both the ratio and stopwatch methods. (Stopwatch determinations were not made for the face tool and center drill.)

A delay allowance of 20.8 per cent was finally set as standard for seven cutting tools on these machines. Delay allowances are set on operations with less than seven tools by subtracting from the standard of 20.8 per cent the total delay allowance of the tool or tools which are omitted.

Percentage May Vary

Since data are collected on a random sample basis, chance errors occur. The percentage of delay observations for one series may vary slightly from the next series, and neither is likely to agree exactly with the percentage found from the total observations.

Data from the first ratio delay study were divided by shifts into series of 30 consecutive running and unavoidable delay observations. The percentage of unavoidable delay observations was calculated for each series. The percentage of each series was then plotted for check on a fraction defective chart.

The percentage of unavoidable idle machine observations during the entire ratio delay study was 14 per cent. The upper and lower control limits of a fraction defective sample as determined by statistical analysis is within the range of 0 to 33 per cent. The result of this check showed that the percentage of idle machine observations for all but one of the series was within the control limits of the chart.

In addition to setting unavoidable delay allowances, the ratio delay study offers an opportunity to observe and evaluate operators, methods, and machines. Wasteful practices and excessive avoidable delays, particularly, are likely to be disclosed by analysis of the data.

1. **Establish objectives**
   a) Market advantages
   b) Manufacturing advantages
2. **Select areas to be surveyed**
3. **Determine standards for type and plan of plant required**
4. **Obtain data on possible sites**
   a) Sites-without-buildings (Figure 1)
   b) Sites-with-buildings (Figure 2)
5. **Survey most-probable sites**
   a) Make field notes
   b) Prepare photographic case histories
   c) Consult executives, town officials on utilities, services, taxes, etc.
6. **Compare characteristics of sites within each area** (Figure 3)
7. **Prepare summary of cities and sites** (Figure 4)
8. **Prepare final summary** (Figure 5)
   a) Compare pertinent costs for preferred site in each area
   b) Recommend first, second, and third choices to management for final decision

Complete details and analysis of these eight steps will be found on the pages that follow

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PRELIMINARY PLANNING

Before searching begins, it is necessary to determine what is being sought, both market-wise and site-wise

THE FIRST STEP IN DETERMINING the location of a new plant is to establish the manufacturer's objectives. Lower over-all costs of manufacturing and distribution, with consequent possible reductions in sales prices, should, of course, always be a foundation consideration. But the prime factor must be: *What market will the plants serve?*

The Market. Two important factors require analysis:

1. Is there an area currently being served by the *main* plant in which (a) the sales potential is not being realized because high transportation costs are boosting sales prices out of line, or in which (b) slow deliveries are resulting in poor customer service?

2. Is there an area currently *not* being served by the manufacturer, but which *is* being served by competitors, in which the establishment of a branch* plant would be advantageous?

In arriving at one or more areas to be surveyed for possible building sites, the sales department should determine the present sales in selected areas, and estimate the potential additional sales that might result from a local manufacturing establishment. An endeavor should be made to approximate some savings, or determine advantages, that would accrue by having a plant in the approximate center of the purchasing population in the area.

One saving might result from lower outbound freight costs from the present supply point. Another advantage might be an increase of sales in the area through quicker and better service. A third consideration may be that a branch plant of a national competitor is located in the area, or is expected to be located there. However, if a competitor is intensively serving a part of the area under study, it is altogether possible that, unless comparable service can be furnished at reasonable cost, this section of the area should be eliminated from the sales potential. The result of such an elimination, of course, would be to shift the search for building sites or vacant plants to the re-evaluated center of the purchasing population in the area.

Production. In similar analysis by the manufacturing ing department, the following should be considered:

1. Possible savings through greater efficiency (i.e., fewer man-hours per unit of output) by the adoption of improved methods in the new plant.

2. Savings in raw material cost, either through reduced inbound freight cost, or greater availability.

3. Lower costs for electricity, gas, water, heat.

4. Possibility of better labor potential from the standpoint of either availability or skill.

From these market and production analyses, a tentative selection should be made of areas to be surveyed for possible building sites or vacant plants.

Plant Factors. Determination of the size of plant required to produce the desired sales quota, and the types or types of structures best suited to the layout required, is the second element of the preliminary planning which must precede the actual survey work. The reason, of course, is that such data in the hands of the plant engineering department at the time the survey is being conducted help eliminate sites that obviously are not suitable.

One of the first things to be decided is whether the new plant will be a complete manufacturing unit, or will manufacture only some of the parts—with others coming from another plant for final assembly.

Another point that must be determined is the type of process that will be used, when more than one is available to the manufacturer. Still another factor to be considered is the variety of product types that will be made. In other words, how much of the manufacturer's line is to be built at the branch plant?

Standard Plans. When these factors have been analyzed and conclusions reached, it is relatively easy to proceed to develop one or more standard plans or plants to accomplish the desired results. One of the first things to be done is to determine the best machine and equipment layout, with a good flow line from the receipt of raw materials to the shipment of finished product. Around this is designed or pictured a building, and around the building is visualized a theoretical plot of ground served by a railroad spur, a paved street, and some sort of public transportation. Maximum flexibility should be provided in this preliminary determination to simplify in so far as possible the later task of final site selection.

Obviously, the development of standard plans for a branch plant will be determined by the product to be manufactured, the process, the equipment necessary, and the amount and variety of product types to be made. This means different conditions for different industries. Here are a few of the points that a manufacturer would consider in developing standard plans:

1. Equipment layout necessary to produce a given daily production base, with sufficient leeway to avoid bottleneck conditions, if faster manufacturing processes are developed, or production is temporarily increased.

2. Provision for expanding the plant, other than on the railroad side, to permit an increase up to, say, 60 per cent in the factory floor area, which would normally allow a 60 to 100 per cent production expansion over the original base.

3. Provision for a substantial delayed shipment storing area. It is of particular importance in industries affected by seasonal sales patterns to provide a

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* Procedures described in this article, although developed as a solution to the special problem of *branch* plant locations, may be applied equally well in choosing the location of *any* plant. ED.

substantial area for storing a large number of component parts produced during slack months. The exact amount of the area will be influenced by the amount of retail trade to be served by the branch plant.

4. Determination of approximate truck and rail shipments to fix requirements for current storing areas and shipping dock space.

5. Provision for a railroad spur and suitable grade entry of not over 2 per cent.

6. Availability of suitable utility connections with adequate service at fair cost, including electricity, gas, water, and sewer.

7. Availability of reasonable transportation and housing facilities for employees.

8. Determination of necessary floor area per unit (or per 1000 units, or other convenient multiple) per 8-hour day, having in mind avoiding crowded conditions, as well as waste of space.

If the problem of establishing branch plants is a frequent one, it is probably best to have prepared in advance standard plans for three to five small plants of different capacities. Plants with sufficient capacity to cause them to be considered "large" should obviously receive special consideration. In addition, it is of considerable value to the men making the survey to have available charts which cover the important points of size and arrangement of the "standard plant" small plants, as well as detailed building plans of areas given over to items on the chart, such as factory office, factory proper, locker and shower rooms, power plant, laboratories, shipping docks, and other specific requirements

Existing vs. New Buildings. This is an inevitable problem in any expansion program. The solution depends a great deal on whether existing buildings examined during the survey are plants of not too ancient vintage, available at the right price, and have the necessary rail, truck, and utility services. Looked at from the other point of view, the availability of construction labor and materials in a particular city must be considered.

While a new building is generally more satisfactory from the production man's point of view, if an existing building can be located which is easily adaptable to the standard plan, it may well be more economical, particularly if the branch plant must be viewed as possibly being a short-term project. The current and prospective general economic situation, therefore, plays a real part in this determination. But, regardless of the economic situation, it is usually desirable to reserve decision on whether to buy or build until the completion of an industrial survey.

Armed with the data about basic requirements outlined above, the plant engineer (or other management representative) is prepared to make detailed surveys in several cities or towns in the selected areas leading toward final determination of a site for the new branch plant.

SURVEY PROCEDURE

A systematic approach to problems in the field means less work and less cost to find the best possible site

IN GENERAL, IT WILL EXPEDITE MATTERS if the engineer's first contact in the area to be surveyed is with officials of the local Chamber of Commerce. These officials can later assist the engineer by introducing him to public utility executives, government officials, industrial real estate agents, and others from whom he may wish to seek information. This procedure, of course, will be varied, depending upon local conditions and the industrial development agencies that are present. However, such introduction sooner or later will be essential, whether operating in the open or incognito, as policy may sometimes require.

The most obvious purpose of the survey is to examine industrial property that is available, and the engineer begins at once with this investigation. Simultaneously, however, he begins collecting other facts for his report. Through one or more of the industrial development agencies, he gets in touch with the proper real estate men, including railroad officials, and the on-the-site examination of industrial areas and individual sites available is begun.

At this point the survey engineer is ready to begin taking notes on his site questionnaires. The first of these questionnaires deals with undeveloped sites (Figure 1). It consists of five pages of questions which require definite answers rather than generalities and opinions. Adequate space is provided for answers, which become the basis for a later comparative analysis.

The second questionnaire (Figure 2) is used by the engineer when he is examining a site on which a building already exists. The seven pages of questions give consideration to whether the building might be suitable in whole or in part, whether it could be enlarged, and so on. This form is adaptable to the examination of properties being considered for rental, as well as in cases where outright purchase is the objective.

While these questionnaires were developed for Willard requirements, they serve to illustrate the general types of information that most manufacturers will want.

Two points should be emphasized in connection with accumulation of data for the questionnaires:

1. While most information for the questionnaire is collected by personal interview, in the first instance, representatives of the various services with whom

SITE-WITHOUT-BUILDING QUESTIONNAIRE

GENERAL

SITE: Location. Dimensions (lineal and square feet). Price per sq.ft. Area. Price per acre. How long will property be available at this price? Is property within city limits? How far from business center of city.

GENERAL CONDITION OF LAND: Level. Varying. Swampy. Dry. Maximum difference in elevation. Soil load for foundations as allowed by city ordinance (tons per sq.ft.). Depth necessary to carry three-story building foundations. Is piling necessary? What depth? Any creeks, culverts, or ravines? Underground obstructions to be removed for excavation.

STREETS: Streets leading to or bounding property, pavement, and width of same. Are they suitable to heavy traffic? Type of surface. Curb to curb width. Total width. Submit special report in detail on any and all streets contiguous to this property which should be or are under consideration for widening, extending, or paving. Give cost to industry, time required, etc.

PLANT REGULATIONS: What consideration need be given locally to the problems of acid waste disposal, lead dust control, and excessive noise?

SERVICE

CITY WATER: Size main. Average pressure. Location and extent of all available mains. Any extensions to main necessary to bring water to property? If so, who pays for extension? Submit city water rate schedule and sample and analysis of water on separate sheet.

WELL WATER: Depth of well necessary. Temperature of well water (high and low). Capacity. Submit sample or analysis of nearby well water.

SEWERS: Is property subject to flooding? How is excess water removed? Sewers? Culverts? Natural drainage?

STORM SEWER: Size. Depth below grade. Material of sewer. Location and extent of main sewer. Any extensions to main necessary to bring sewer to property? If so, who pays for extension?

SANITARY SEWER: Size. Depth below grade. Material of sewer. Location and extent of main sewer. Any extensions to main necessary to bring sewer to property? If so, who pays for extensions?

PLANT WASTE: What restrictions as to acid, lead, or other wastes entering main sewer? Must acid be neutralized before entering sewer? Must lead dust be settled out? Which sewer takes plant waste?

GAS: Available supply — natural. Size main. Location and extent of gas main. Any extensions to main necessary to bring gas to property? If so, who pays for extension? Gas pressure. B.t.u. content of gas. Amount available. Gas cost rate.

ELECTRICITY: Company. Generated by hydro or steam. Distance to nearest generating stations. Voltage of main feeders. Location of nearest feeders. Underground? On poles? Transformers for plant supply furnished by? Location. Current run to plant (volts, phase, and cycle). Submit power rate schedule on separate sheet. Submit complete report on switch gear and wiring specifications required by power company, or local or state code.

TELEPHONE: What company serves this district? Location of nearest trunkline. Any extensions to trunklines necessary to bring phone service to property? If so, who pays for extension? Submit rate schedule for service.

RAILROAD SIDING SPECIFICATIONS: Is railroad right of way level above or below main property elevation?

TRANSPORTATION: Distance to nearest freight depots of each railroad for L.C.L. shipments? What switches or sidings are now serving the property? Length. Cost. What railroad company? Switchings per day. Time—a.m. and p.m. Time allowance for holding cars. Demurrage rates.

FIRE PROTECTION: Distance to nearest city fire station. What fire apparatus available in this station? Location of nearest fire plugs?

BUILDING DATA: Any hazardous plants nearby? Distance to nearest manufacturing plant. Distance to nearest dwelling. What type buildings allowed on property by city? Distance from street to building line. From lot line to building line.

EMPLOYEES: How far must employees walk from car lines to property? From bus line? Approximate distance to homes of factory workers from property. Length of time required to reach property from home district by streetcar or bus. Are restaurants or lunch rooms near property for office workers, shop workers? City streetcar fare? City bus fare?

TAXES: Basis of tax valuation. Tax rates for city, county, school, improvement, miscellaneous, and total.

FIGURE 1

RENTAL CHECKLIST AND

SITE-WITH-BUILDING QUESTIONNAIRE

GENERAL

LOCATION: Legal title in name of. Any mortgages or other liens? If so, give names, amounts, and status.

GROUND SIZE: Area. Adjacent streets. Distance from center of town.

CONSTRUCTION: Walls and roof.

BUILDING CHARACTERISTICS BY FLOORS: Size, condition, area, headroom, volume, floor type, number square feet safe floor load. Are blueprints available?

FUEL

GAS: Size gas main (natural and artificial). Gas pressure. Capacity gas. Gas cost rate. Gas company.

OIL: Size oil tank. Filling location. Location of tank.

HEATING: Buildings heated by hot air, air fins, steam press, vapor system, vacuum return. Location radiators or air fins. Heating plant type, size. Fuel. Firing method. Storage fuel. Condition of heating system. Condition of heating boiler.

SERVICE

CITY WATER: Size main. Average pressure. Location of main source of water. Cost rate.

WELL WATER: Depth well. Temperature (high and low). Capacity. Condition.

SEWERS: Size sanitary connections. Size storm. Service charges. Condition.

PLANT WASTE: Restriction as to acid, lead, or other wastes. Neutralize acid required.

PLUMBING CONNECTIONS: Toilets. Location. Urinals, seats. Wash basin or trough. Condition.

FLOOR DRAINS: Locations.

WATER IN BUILDING: Hot water service (coal, oil, electricity, gas). Cold water service. Condition.

ELECTRICITY: Name of company. Trunk line location. Rate schedule. Size and kind of service (kw.,voltage, phase, cycle). Uses of electricity (present): Lights (each floor), heating, elevator, power. Condition. Uses of electricity (proposed): Power, charging.

ELEVATOR: Serves which floors? Make. Capacity. Size platform. Size doorways. Power. Condition.

FIRE PROTECTION: Nearest plug. Nearest station. Sprinkler system. Type. Source. Head. Condition.

ALARM SYSTEM: Sprinkler. Watchman. Burglar. Condition.

RAILROAD SIDING: What R.R.? Number tracks. Trackage. Dock length. Width. Covered? Door openings. Elevation respective to main.

TRUCK DOCK: Size. Elevation respective to main dock. Covered? Doors. Condition.

PLANTS OR BUILDINGS ADJACENT: Buildings. Construction. Occupancy.

GUARDING PROPERTY: Windows locked or screened.

DOORS OUTSIDE: Number, locked, screened.

RECONDITION PROPERTY AND BUILDINGS: List repairs necessary starting at basement and including roof. List as to item, description, estimated cost, to be done by, check paid by owner or company.

TERMS: Least period of lease. Rental, month, year. Rental per square foot per year. Occupancy starts. Lease renewable. List usage of other floors in building. Above data checked and verified by agent? By investigator? Date.

FIGURE 2

the engineer speaks should be asked to confirm their verbal answers in writing.

2. It is important for the survey engineer to get in touch with city officials, and the state and county health officials, to secure the proper data, and, in addition, to secure assurance of their acceptance of the proposed industrial operation in the area.

To simplify explanation and evaluation of survey data at a later time, photographs and maps are most useful.

CONTINUED ON NEXT PAGE

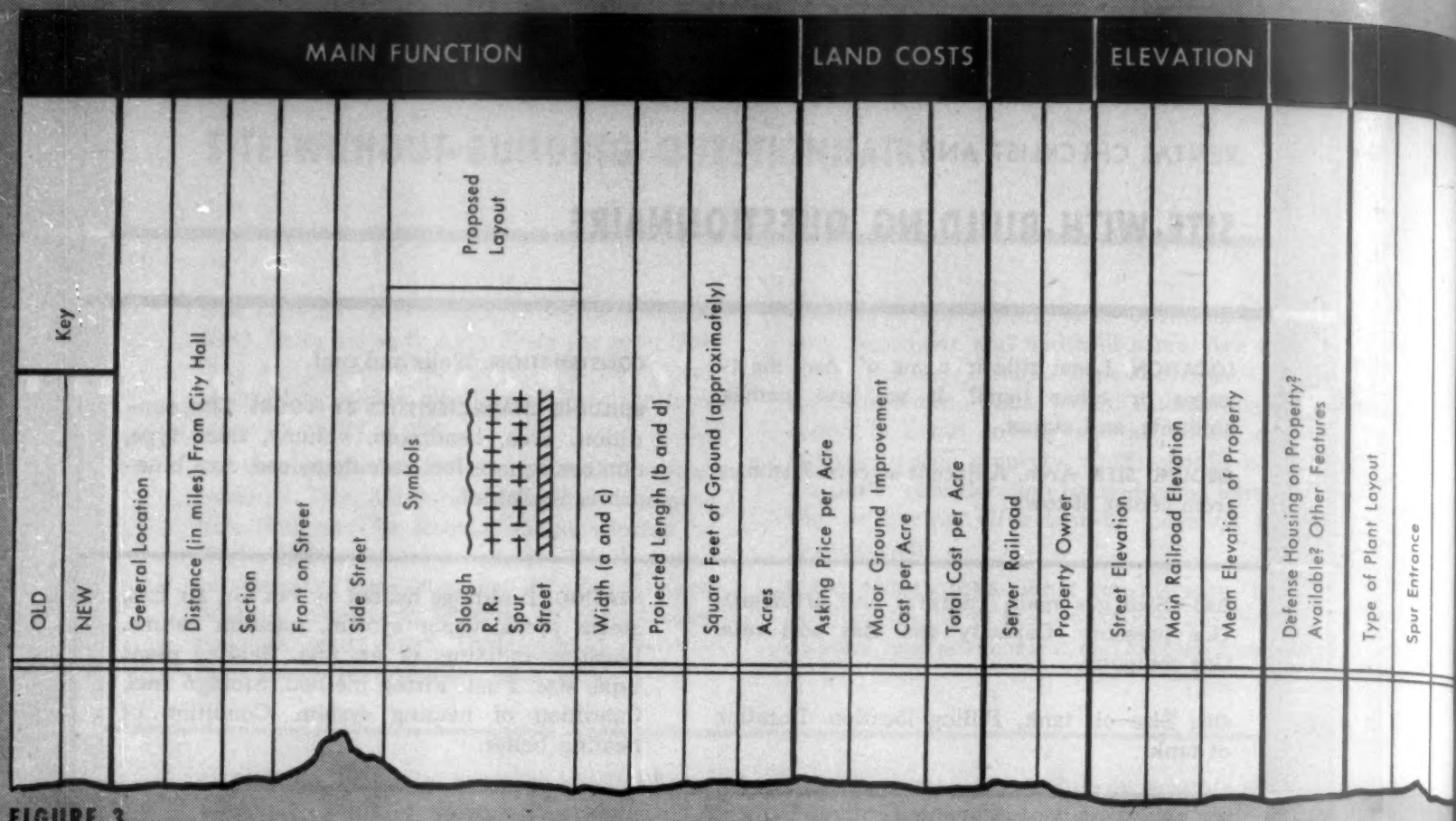


FIGURE 3

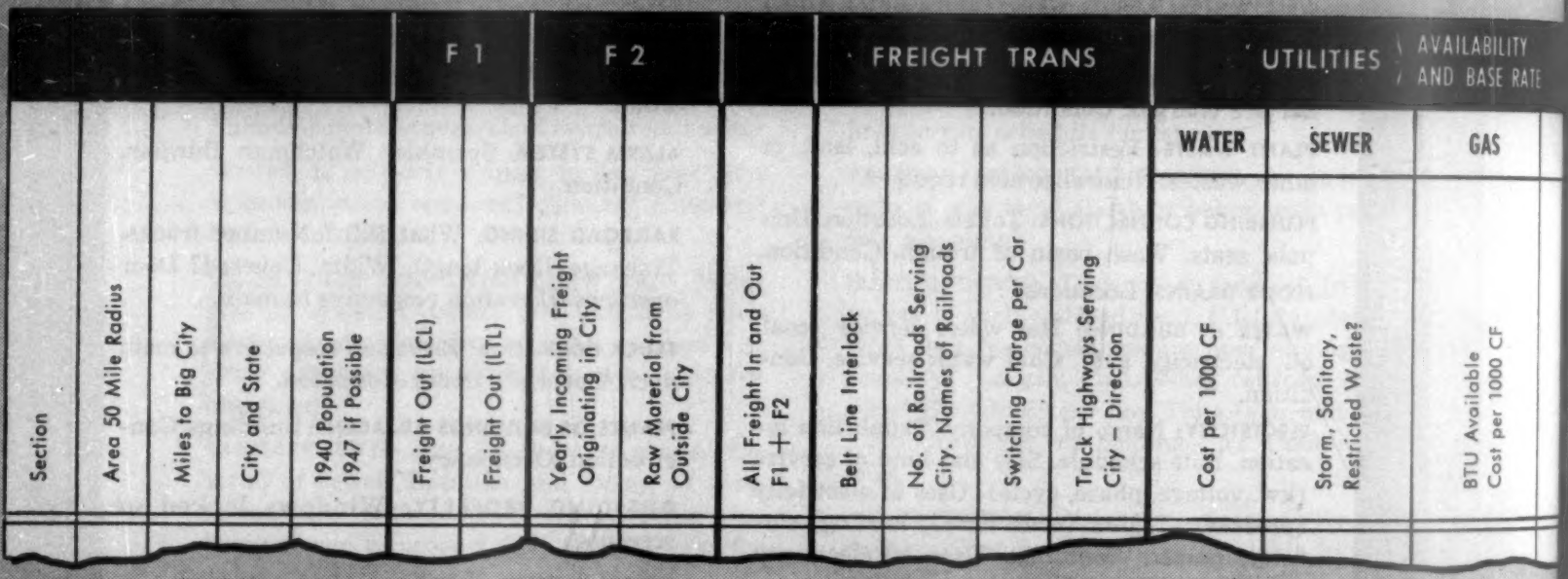


FIGURE 4

PREPLANNING FOR PLANT LOCATION . . . continued

Photographs. Aerial photographs are extremely valuable when they show the general area, contour of the land, and conditions of adjacent property, as well as highways, railroads, creeks, rivers, and other topographical details. They are particularly useful in giving an idea of the site to those who are not accustomed to maps and industrial prints.

Pictures are usually taken of the area from the main roadway along the four directions, and are usually supported by side views and close-ups showing land contour, obstacles to be removed, and other physical conditions. Prints should be carefully identified and dated while the subject is fresh in the engineer's mind, and also keyed into the sketch of the plot to which they relate. Care should be taken, too, to see that any enlargements are fully identified. The necessity of identification becomes obvious when it is remembered that the engineer will probably see a large number of sites in several strange cities.

Maps. When a large area is to be checked, a map of the territory may well serve as a starting point. For specific details, state, country, metropolitan, industrial area, and railroad maps also are useful. In many cases it is helpful to determine the scale of the map immediately and mark it plainly on the border.

A large scale map of the industrial section of a city under study is particularly helpful. Designation of

ITILITIES							
WATER	SEWER		GAS	ELECTRICITY			
Demand Av. CF/Mo C. 100,000 CF/Mo	Demand Max. Flow Hr. Gal. at 4 to 5 p.m.		Demand CF/Mo	Demand Av. KW/H			
Location and Size of Main. Pressure	Location and Size		Av. Cost 1000 CF. Kind (BTU/CF). Size of Main. Location, Pressure	Av. Cost 1000 Kwh. Elec. Power Co. HT. Voltage. Substation Location	Bus and Streetcar Transportation	Truck Roads	Adjacent Plants
	STORM	SAN.					

	LABOR				UNOCCUPIED ACREAGE	
ELECTRICITY						
Available ELP Co. Cost per 1000 Kwh.	Labor Supply – Type Transient?	Base Rates Mill Machinists	State Labor Legislation	Industry Tax Condition	Range in Cost Improvement per Acre	Parcel Number

areas of likely interest on such a map aid the engineer greatly in properly directing his efforts.

COMPARISON OF SITES AND CHARACTERISTICS

When the questionnaires covering various sites have been completed and the situation has been reviewed with all public utility, city, county, and Chamber of Commerce officials, the data should be recorded on the first comparison summary, "Comparison of Sites and Characteristics" (Figure 3). This is done for each city surveyed, with sites being shown in the sequence in which they were viewed, with brief key information.

On this first summary, under the heading of "Main Function," are listed certain physical data including a sketch of the plot with streets and railroads. Land costs, improvements required, railroad service, utilities available, transportation, and highways are some of the items on this chart. Certain utility data are entered also.

Complete utility costs for the different services for each site in each city are calculated on the basis of predetermined consumption and the rate schedules given by suppliers. For this purpose, Willard uses certain forms which may be of interest as indicating the types of information generally sought by manufacturers in such a utility survey.

Form E-1: Electricity consumption and calculation of cost from utility rate schedules. On this form are noted: Place (city). Site number. Size of plant (units per day). Supplier. Supply—voltage, cycles, phases, kw. Plant usage for (1) lighting, (2) power, (3) heating, (4) d.c. conversion. For each of the foregoing, the following data are required: Kw. connected; average consumption, kv. per hour; kwh. consumption per month; hours per day; hours per month; and transformer size. Also noted is the peak kilowatt demand for a 30-min. period, and the mean cost per kilowatt-hour.

Form G-1. Gas consumption and calculations. On this form are noted: Place (city). Site number. Plant size (units per day). Commodity—natural, artificial, mixture. Supplier. Supply—B.t.u. per cubic foot, sulphur content, pressure (p.s.i.), size of main, size of feeder, available cubic feet per day, available cubic feet per hour. Plant usage for (1) fuel gas—heating; (2) fuel gas—boiler; (3) fuel gas—process. For each of these uses, the following data are required: Maximum demand in cubic feet per hour (computed at 1100 B.t.u. per cubic foot); maximum demand in cubic feet per month; hours per day; hours per month. Mean cost per 1000 cubic feet and per hour is also noted.

Form W-1. Water charges. On this form are noted: Place (city). Site number. Plant size (units per day), commodity—city, county, or well. Supplier. Supply available—size of main, average pressure (p.s.i.) location of main. Plant usage for (1) lavatory water, (2) process, (3) cleaning, (4) sprinkler. For each of these uses, the following data are required: Gallons per hour, gallons per month, cubic feet per month, hours per day, hours per month. Mean cost per 1000 cubic feet should also be noted.

In addition, it is also essential that the engineer secure an analysis of both gas and water, as it is possible that certain contents of either might affect manufacturing or chemical processes.

Other Cities. If the characteristics of the business permit consideration of communities of various sizes for plant location, it is usually desirable to survey more than one city in each selected area. For example, surveys might be made of large cities containing a sizable population, as well as of other communities within the, say, 50-mile metropolitan area of the large city. The survey may also include small cities and towns isolated from large metropolitan areas, but on main truck or rail lines. Should the small towns in a given area be located in two or more ad-

			A			B				C						
			FREIGHT			UTILITIES				LABOR		FIRST YEAR – ONE SHOTS				
City and Population	Miles to City	Mean Miles for Incoming Material	In	Out	Total	Water	Gas	Electricity	Total	Total Cost Per Year MH x I/H	Annual TOTAL A + B + C	Land Costs and Site Improvement	Spur	Gas Main	State Bldg. Tax	TOTAL

FIGURE 5

jacent states, it is necessary to collect comparative data relating to state taxes, utilities, manufacturing regulations, health regulations, legislation, labor conditions, and climate to allow proper comparison of the strong and weak points of the cities.

COMPARISON OF CITIES AND BEST SITES

Following the analyses of sites by cities, the engineer prepares a second chart, "Summary of Cities and Sites" (Figure 4). This chart comprises a general tabulation of cities and metropolitan areas in which one or more sites were surveyed. It might be considered a boiled-down version of the first comparison summary previously discussed, with other information added.

While repeating some of the previous data, this chart also shows the annual outgoing freight costs from the particular city to shipping destinations, and freight costs of incoming material from supply points.

Details of utility costs are placed on this summary, including any special charges that may be required, such as a transmission charge on gas or electricity because of distance from a metropolitan area. Regulations and facilities for disposal of industrial waste and sewage must also be checked and recorded.

Additional information on this second summary includes community labor rates, conditions of labor activity, local laws, housing, transportation, and the attitude of the community toward new industry. From this summary it is possible to obtain a good picture of the "intangibles" involved, as well as comparison of the physical and cost factors.

FINAL SUMMARY

The last step in the survey procedure is the preparation of a final summary (Figure 5) of the pertinent costs involved for each site surveyed. This is divided into two parts, covering the preferred sites in each city. Briefly, the first three columns on the form identify the cities from the previous chart. The next several columns comprise items of *continuous* yearly costs—in other words, costs that may be expected to recur year in and year out, or so long as the plant is maintained in operation (barring, of course, changes in rates). The next several columns (Part 2 of the summary) tabulate certain initial costs for each site involved. Such elements of cost, of course, assume greater or lesser importance, depending upon the projected term of use of the branch plant.

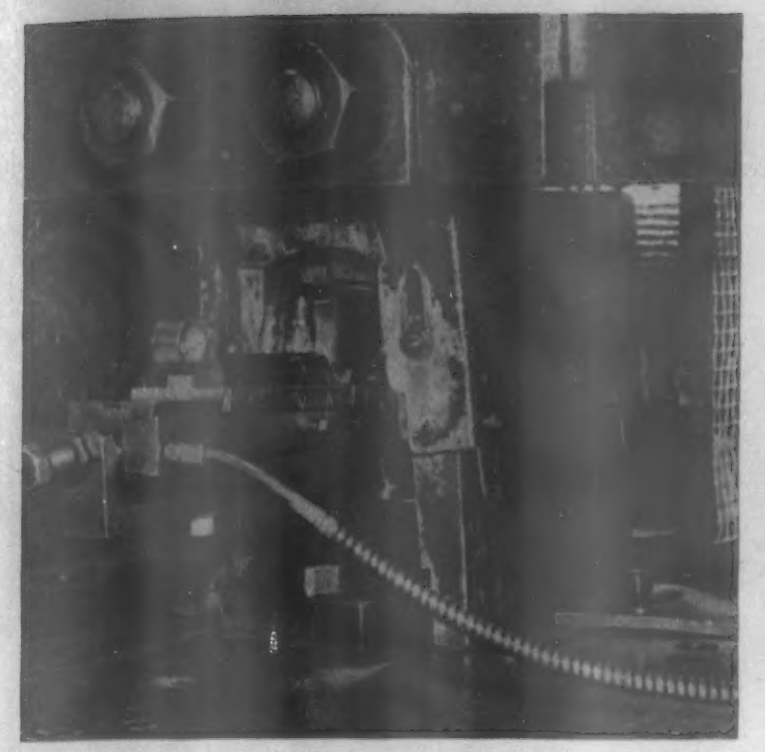
This final summary is submitted to management with the survey engineer's conclusions and recommendations as to the best city and best site, with indicated second and third choices.

Design and Construction. During the time of the survey, the engineer will have been in touch with one or more architectural engineers and contractors in the localities being studied. He endeavors to secure opinions relative to the best building construction for the area, as well as comments on other possible types of construction. Opinion is also solicited concerning external and interior appearance, durability, and availability of material and labor. From these the engineer prepares a chart showing the over-all preferences for various types of construction, together with a cost comparison.

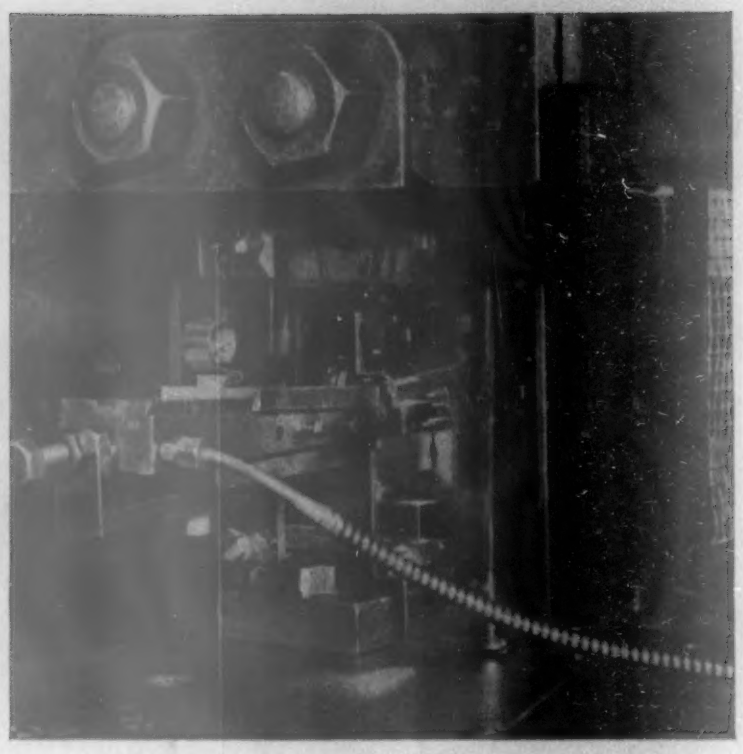
A tentative time schedule is worked out with an architectural engineer or contractor which covers the various steps from buying the land, preparing final design and specifications, construction or alteration of the building, and through to trial operations of the completed manufacturing plant.

This information is of value to management in order that it may know approximately when production may be expected from a plant on the proposed site. Usually two architectural engineers and two contractors submit these preliminary estimates for study, and in the end one of each is selected for the final job.

It is customary to have a representative of the plant engineering staff on the site during the erection or alteration of the building, installation of equipment, and the preliminary operations of the factory. Weekly reports and photographs of construction progress are sent to the main office, together with data of any changes in building or layout that are found necessary or expedient. All this material becomes a part of the "experience" files for use when considering additional branch plants.



OLD GUARD. Used on die with slide feed. Guard, difficult to store, telescopes to fit die. Large openings make it possible for the operator's hand to enter nip area



NEW GUARD for same die is permanently attached. Opening of 3/8 inch is far enough from die to protect operator's hands. Plastic affords excellent visibility

PLASTIC GUARDS MADE INTEGRAL WITH PUNCH PRESS DIES

M. F. BIANCARDI • MANAGER, HEALTH AND SAFETY DEPT., INDUSTRIAL RELATIONS DIV., ALLIS-CHALMERS MANUFACTURING CO., MILWAUKEE

To OVERCOME numerous operating difficulties experienced with existing punch press guards, Allis-Chalmers embarked upon a general guard-standardization program.

As a result, guard storage problems have been solved, set-up time on many dies has been materially reduced, and morale of press operators has improved.

To inaugurate the program, a committee of engineers and shop supervisors surveyed punch press operations. From their studies and analyses, these specifications were developed for standard types of guards:

1. Safety code requirements must be met.
2. Operators must be protected.
3. Guards must utilize minimum storage space.
4. Maximum visibility must be afforded.
5. Guards must be made simply and economically.
6. They must be durable.

One result of the committee's proposals was the development of guards like the one shown above. At the left is the obsolete adjustable metal guard providing dubious security from injury. This type of guard could not be conveniently stored. Application to the press required costly installation time.

At the right is the new, individual, complete-enclosure, plastic guard for blanking and light forming operations on flat stock. It affords maximum protection. Visibility is improved. Moreover, it is attached permanently to the die and is, therefore, stored right with the die it fits. At the rear is an ejection guard of metal angles and wire mesh for additional protection.

Where the plastic guards cannot be applied, other types are specified, such as the two-hand control with a non-repeat device.

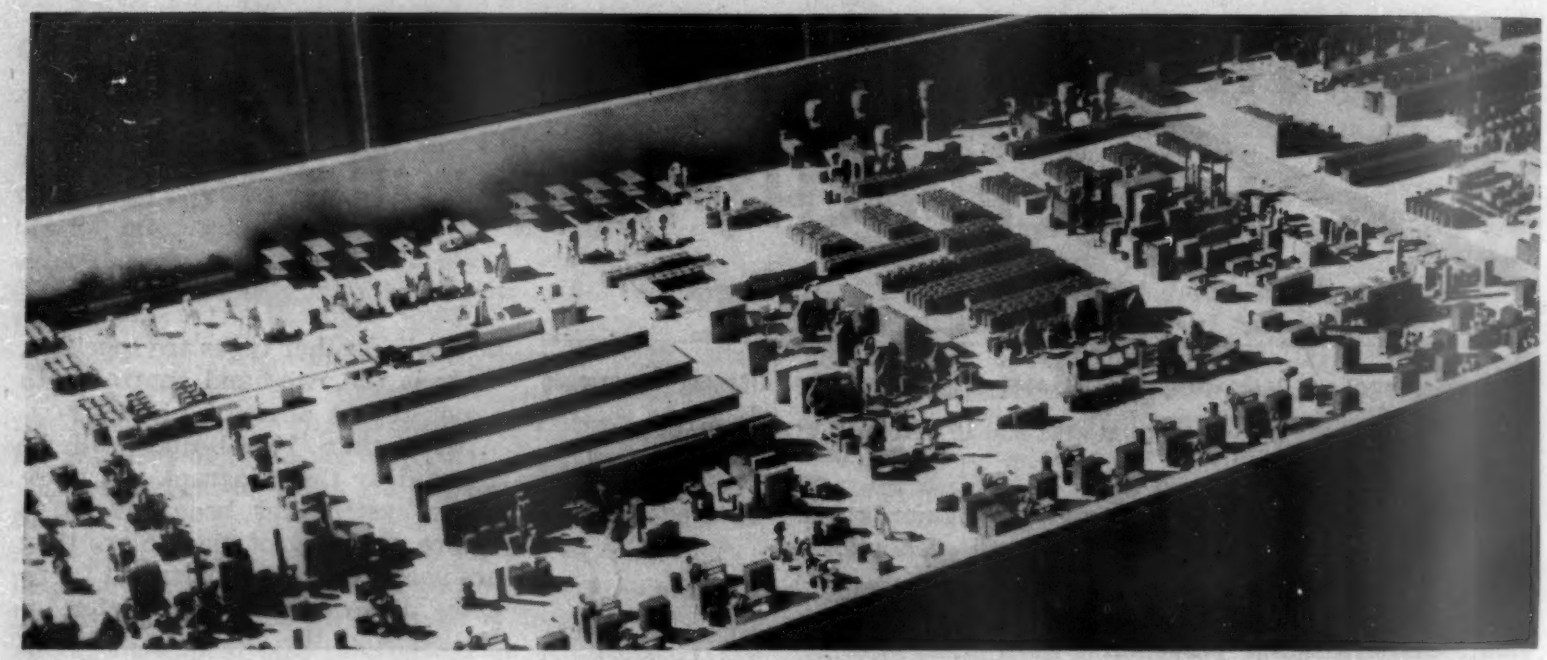
More than 10,000 dies will be affected by this program. An automatic system has been set up to insure guarding of dies before they are used. A guard department fabricates dies developed and later installed by the tool engineering department. A new guard must be inspected and approved by the health and safety department before it can be placed in operation.

Approved Before Use

Approval cards are issued by the time study department as authorization for each guard's development and installation. A copy of each card is retained by health and safety, and the master card is filed by time study after the guard has been installed. A die data sheet prepared by tool engineering contains all technical material necessary for design and fabrication.

Press inspectors report periodically on the operating condition of all dies and guards.

EVERYONE CAN UNDERSTAND . . .



. . . SECTIONAL SCALE MODEL . . .

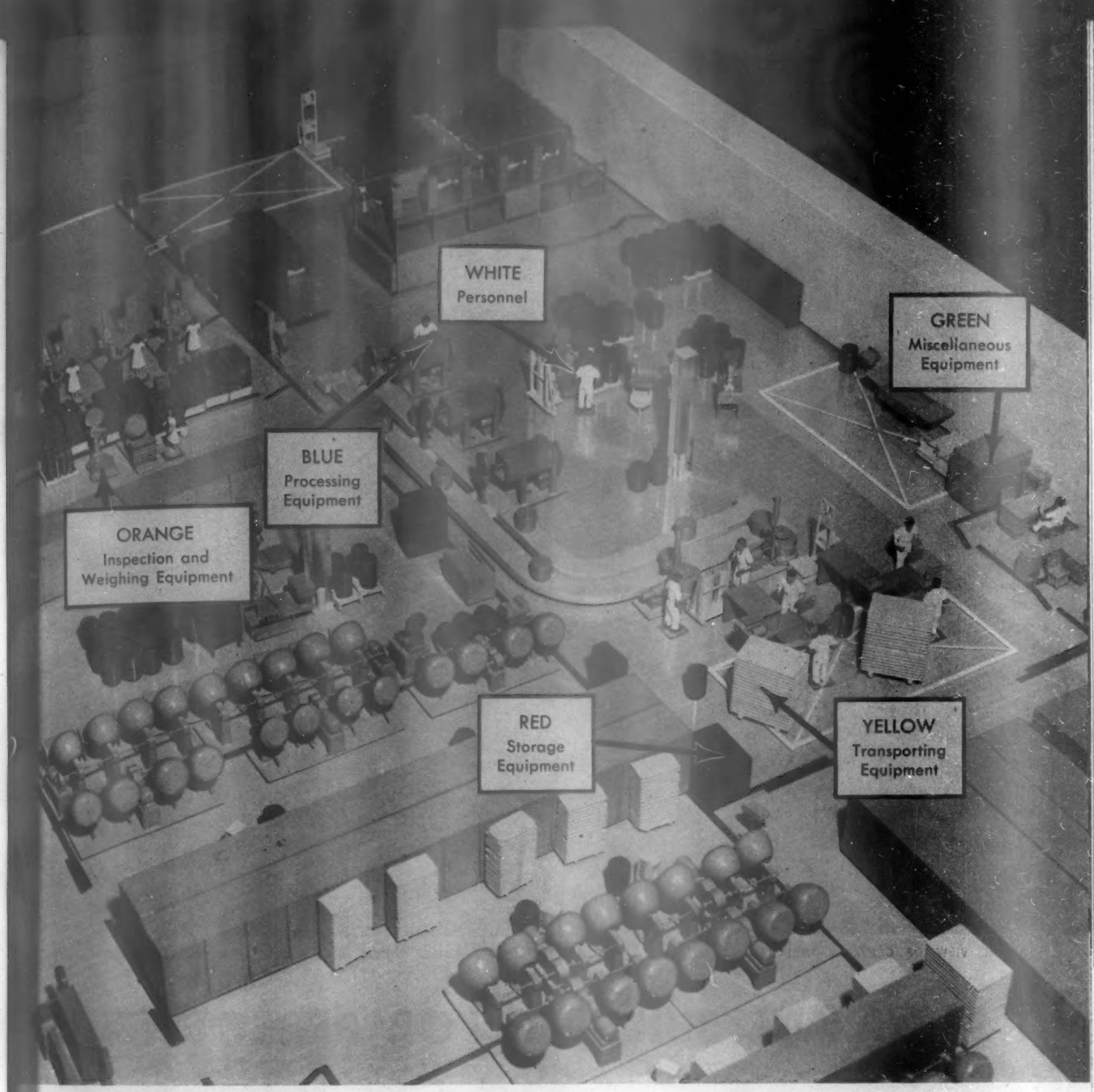
WILLIAM S. WHEELER • FIELD EDITOR, FACTORY, CHICAGO

THREE-DIMENSIONAL SCALE MODELS are helping production personnel and layout and methods engineers plan more efficient production at The Upjohn Company, Kalamazoo, Mich. And the use of a complete color code makes it easier for everyone to understand and interpret problems set up on the model.

Two features of this particular model set it apart from "typical" models in more general use throughout industry:

1. Dimension lines are scored in a frosting applied to the *underside* of the transparent plastic floor. The result is a neater appearance, less chance for scratching and deterioration of the frosting, and scoring as models are moved about.

2. The model is built in six independent sections, each approximately 8 feet long and 45 inches wide. By moving the sections apart it is possible to reach any particular point on the model without undue strain or fatigue resulting from long reaches. When an integrated view of the over-all



. . . WITH COMPLETE COLOR CODE

plant is required, the sections can be moved together to provide it.

Color Coding

The color code used is as follows: *Blue,* processing equipment; *red,* storage equipment; *yellow,* transporting equipment (fixed and mobile); *orange,* inspection and weighing equipment; *white,* personnel; and *green,* miscellaneous identification, such as workbenches, sinks, and office equipment.

Cost of the model has been repaid in many ways. But Upjohn executives cite two "plus" values, which cannot be measured in dollars and cents, obtained through the change from paper templets to scale models of the plant:

1. Personnel unskilled in blueprint reading can visualize proposed layout changes and contribute worth-while suggestions.

2. Visitors to the plant can get a better picture of the company's *over-all* production operations by viewing the model than by either examining templets or making a complete tour of the plant.

The model is being used extensively at the present time in planning the transfer of all facilities—without the loss and inconvenience of interruption to production—to the plant's new location just outside Kalamazoo.

AERIAL VIEW OF CHEVROLET-INDIANAPOLIS SHOWS (IN CIRCLE) THE NEW BUILDING WHICH HOUSES ALL PERSONNEL FUNCTIONS

SEPARATE BUILDING FOR PERSONNEL

Centralized personnel facilities simplify problem of controlling movement of employees in a big plant

M. R. HARRIS • PLANT ENGINEER, CHEVROLET-INDIANAPOLIS DIVISION GENERAL MOTORS CORPORATION, INDIANAPOLIS

NOWADAYS WE BUILD the plant around the process, not the process around the plant. Why not the same approach to handling the coming and going of factory people?

Actually, that is the approach we used at the Chevrolet-Indianapolis Division when we expanded plant and office facilities. The movement of factory personnel had become a serious problem. It had an important place in our planning. We solved it primarily by segregating the vehicle and employees' entrances and by making each as convenient as possible.

The vehicle entrance was located near the back of the building, as far as possible from the employees' entrance, and as near as possible to shipping and receiving.

The employees' entrance is centrally located in relation to parking and streets ordinarily used by workers, and the main entrance to the factory buildings.

Confusion is avoided by having all personnel activities separated from the administration building, and by the layout of the personnel building itself—of which the employees' entrance is an integral part. The main floor is elevated above ground level, and so arranged that pedestrian traffic does not interfere with the normal functioning of the personnel department.

The area used for people seeking employment is separated from the rest of the departments in the building by a masonry wall, which allows clerical work to be carried

ONLY EMPLOYEE ENTRANCE TO PLANT IS THROUGH GATES (SHOWN ABOVE) WHICH ARE LOCATED IN ONE WING OF THE NEW STRUCTURE

FUNCTIONS MINIMIZES CONFUSION

on with a minimum of interference, and insures the privacy of personnel department executives.

The patrol service, which controls all movements of factory personnel, is housed in the basement.

The building was designed to handle three different groups of people efficiently—employees arriving and leaving at shift time; employees leaving or arriving at irregular hours; people who are seeking employment.

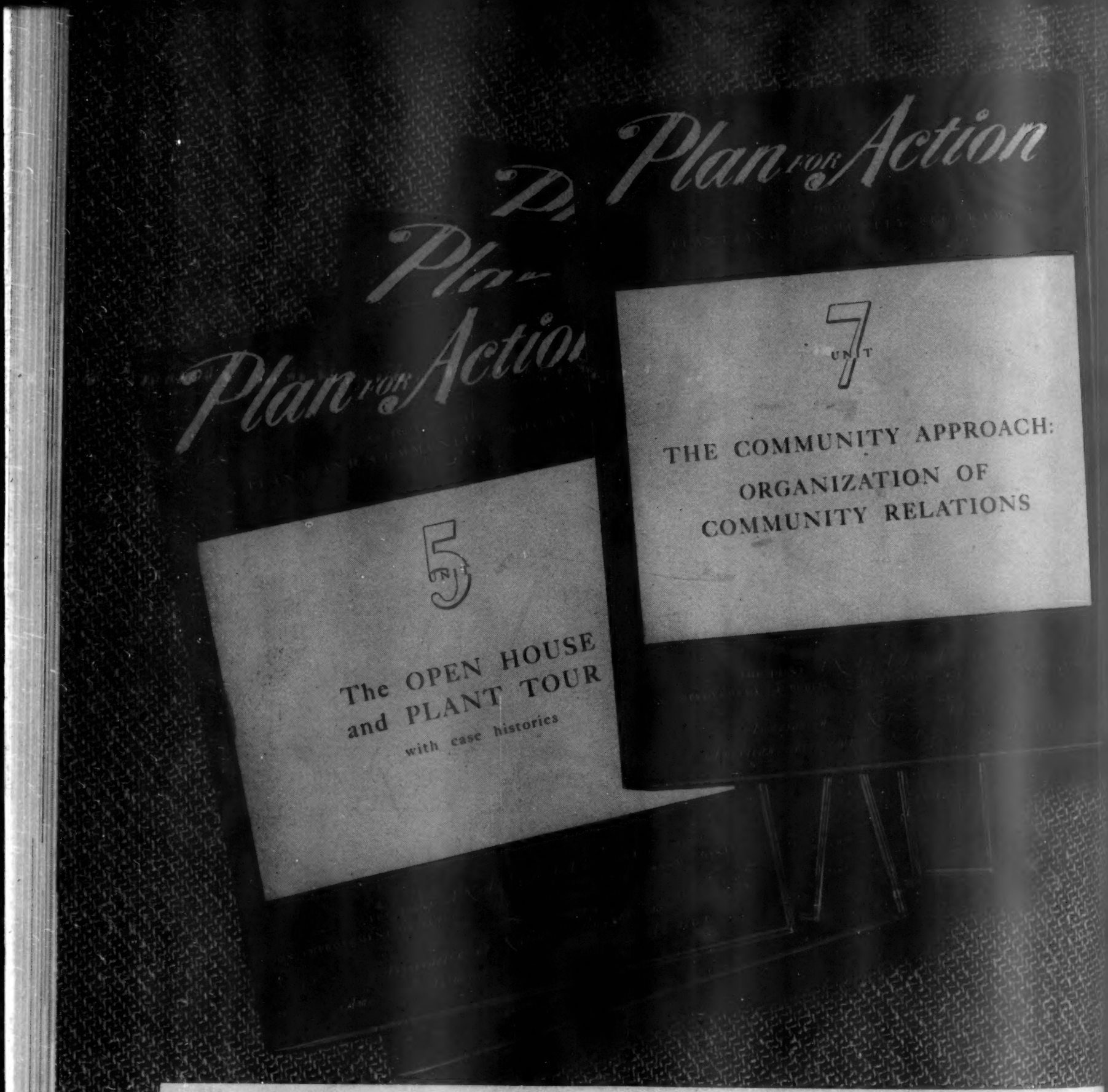
At the end of the entrance is a divided gate, electrically operated. One part of the gate covers two of the entrance aisles, the other covers two entrance aisles and a passageway for ambulance use. The gates are controlled by pushbuttons located in the guard station. The number of aisles uncovered depends on the rate at which workers are coming in or leaving, and can be changed at will.

As workers enter the aisles they are guided, single file, by pipe rails, past raised islands where patrolmen stand to check badges, packages, lunchboxes, and so on.

When shift time is over all main gates are closed, and a small gate is opened, allowing passage up to a platform that runs parallel to the aisles and leads to the guard station. Thus all late-comers must go through the guard station and get a "late pass" before proceeding to their work stations. The platform is used also by those who have business with the paymaster or records department.

People seeking employment are shown into the waiting room by a patrolman. From there they are taken into the interviewing rooms. If they are hired, they go successively through medical examination, X-ray, photographing, and write-up. They are then conducted to their jobs by one of the guards.

The interior walls of the personnel building are buff-colored glazed tile; floors are green asphalt tile; and ceilings are white acoustic material. Fluorescent lighting is used throughout. The atmosphere is quiet and dignified—which, management feels, gives a good first impression to prospective employees.



SEVEN BOOKLETS, written and tested by top men in public relations field, make up "Plan for Action" kit, offered management by a joint committee set up by two large advertising groups

"PLAN FOR ACTION" HELPS INDUSTRY WITH ITS PUBLIC RELATIONS

National advertisers and agencies have developed an integrated program to improve public understanding of how the American economic system works

How to tune a piano!

The piano's out of tune. So we'll chop it up. Then we'll get a tin horn instead.

Sure, these men are crazy.

But they're using the same kind of thinking a lot of people have been using on the American economic system lately.

Our American way isn't perfect. We still have our ups and downs of prices and jobs. We'll have to change that. But even so, our system works a lot better than the second-rate substitutes being peddled by some countries we could mention.

It works better because of a few simple things. We are more inventive, and we know how to use machine power to produce more goods at lower cost. We have more skilled workers than any other country. We believe in collective bargaining and enjoy its benefits. And we Americans save—and our savings go into new tools, new plants, new and better machines.

Because of this, we produce more every working hour . . . and can *buy* more goods with an hour's work than any other people in the world.

We can make the system work *even better*, too: by *all* of us working *together* to turn out more for every hour we work—through better machines and methods, more power, greater skills, and by sharing the benefits through higher wages, lower prices, shorter hours.

It's a *good* system. It can be made *better*. And even now it beats anything that any other country in the world has to offer.

So—*let's tune it up, not chop it down.*

Want to help? Mail this!

I want to help.

I know that higher wages, lower prices, shorter hours and larger earnings can all result from producing more goods for every hour all of us work.

Therefore, I will ask myself how I can work more effectively every hour I am on the job, whether I am an employee, an employer, a professional man or a farmer.

I will encourage those things which help us produce more and add to everyone's prosperity—things like greater use of mechanical power, better machines, better distribution and better collective bargaining.

I will boost the good things in our set-up, and help to get rid of the bad.

I will try to learn till I can about why it is that Americans have more of the good things of life.

Please send me your free booklet, "The Miracle of America" which explains clearly and simply, how a still better living can be had for all, if we all work together.

Public Policy Committee
The Advertising Council, Inc.
Department A
11 West 42nd Street
New York 36, New York

Name_____

Address_____

Occupation_____

Approved for the:

PUBLIC POLICY COMMITTEE of The Advertising Council

by: EVANS CLARK, EXECUTIVE DIRECTOR, TWENTIETH CENTURY FUND · PAUL G. HOFFMAN, FORMERLY PRESIDENT STUDEBAKER CORPORATION · BORIS SHISHKIN ECONOMIST, AMERICAN FEDERATION OF LABOR

Published in the Public Interest by:

SPONSOR'S NAME

ADVERTISEMENT (above) offering booklet (right) is one of a series in national campaign

MANAGEMENT can now get—at negligible cost—professional help in all phases of public relations.

For example, let's say Roe & Company, a small manufacturing concern in Centertown, Ohio, has decided the time has come to bolster employee and community relations. Through a special service now available to all industry, the company can:

1. Get "Plan for Action," a set of seven brochures, written by some of the best public relations men in the country, and tested for effectiveness. Subjects treated are over-all philosophy, employee

opinion surveys, employee communication methods, open house and plant tours, organization of community relations, and findings on community relations. Cost, $7.50.

2. Ask for—and get—expert help in adapting one or more suggestions in these brochures to fit Roe's local problem. Experienced public relations counsel is available to advise a management on all phases of setting up a program, putting it into motion, and keeping it running effectively and smoothly. No obligation is involved.

3. Receive, free, copies of advertisements which will be running nationally in 16 magazines or more, for use in community newspapers and other publications. The national prominence of these advertisements will enhance their value to the firm, tying in handily with its individual efforts.

4. Buy, at cost, pamphlets developed by two prominent national magazines; a sound-slide film in color; other public relations material now under preparation.

This service is offered as part of an ambitious program worked out by the Joint Committee of the Association of National Advertisers and the American Association of Advertising Agencies. Its objective is to give the public a better understanding of how the American economic system works.

To accomplish the vast job in education, the committee has developed a two-level campaign:

At the community level. Companies receive a briefing on the drive for better labor-management, plant-community relations. A number of firms already have adopted the committee's ideas on what can be done to improve them. Clergy, teachers, and educators, in high schools and colleges, are being lined up. The objective is to enlist whole communities in the effort.

At the national level. A sustained advertising campaign in magazines and newspapers with 40,000,000 readers will be launched next month. Initial advertisements will appear on pages donated by publishers. Later advertisements in the series will be paid for with money raised from individuals and companies, on a voluntary basis. Funds for this purpose, the committee says, already are rolling in.

In this way, the committee aims to clear up the widespread ignorance and misunderstanding that exist in connection with the term, "the American Economic System." Members of the group admit that they themselves could not at first agree on the meaning of the phrase. To pin it down, hundreds of businessmen, labor leaders, educators, economists, and research specialists were questioned. From this mass of data emerged a 10-point platform which deals in fundamentals almost anyone can understand:

1. Freedom of the individual to work in the callings and the localities of his choice.

2. Freedom of the individual to contract about his affairs.

3. Freedom of the individual owner of property to start and manage an enterprise, to invent and profit, to buy and sell in a free market—as far as this freedom does not conflict with the public interest.

4. Freedom of the individual to speak, inquire, and to discuss.

5. Protection of the individual—by public or private means—against the basic hazards of existence over which he may have no control.

6. Government action in economic affairs when necessary to insure national security or to undertake socially desirable projects when private interests prove inadequate to conduct them.

7. Freest possible competition consistent with the public welfare.

8. Free collective bargaining—the right of labor to organize and to bargain collectively with employers.

9. Expanding productivity as a national necessity. American experience has proved that it is in the long-run interest of all to (a) pay labor progressively higher wages in relation to prices; (b) do this by progressively increasing productivity per man-hour through the application of constantly greater mechanization, powér, efficiency, and skill in the processes of production and distribution; and (c) reduce hours of labor and improve real income while increasing the volume of production and distribution.

10. Increased recognition of human values as a prerequisite to better living.

Here, surveys showed, were principles in which the vast majority of Americans believe—whether they are members of unions, or boards of directors, or simply a part of the general public.

Taking advantage of this fact, each national advertisement carries the specific approval of a public policy committee. On it sit Paul G. Hoffman, formerly president of Studebaker Corporation and now head of the Economic Cooperation Administration; Boris Shishkin, economist for the American Federation of Labor; and Evans Clark, executive director of the Twentieth Century Fund. A host of other prominent Americans, representing both the liberal and the conservative point of view, also have come out in favor of the program.

Germ of the idea that grew into the present campaign sprouted back in 1946 in the minds of top officials of the ANA and AAAA. Sparked by Don Belding, head of the advertising firm of Foote, Cone & Belding, these men established the joint committee to develop the idea into a workable plan that would:

1. Show that management, labor, and all other groups agree that the American system has one over-all purpose—to strive for a better living for everyone.

2. Point out that this is achieved by higher productivity and wider distribution.

3. Expand public understanding of the role of free collective bargaining.

4. Demonstrate that economic freedom and political freedom are interdependent.

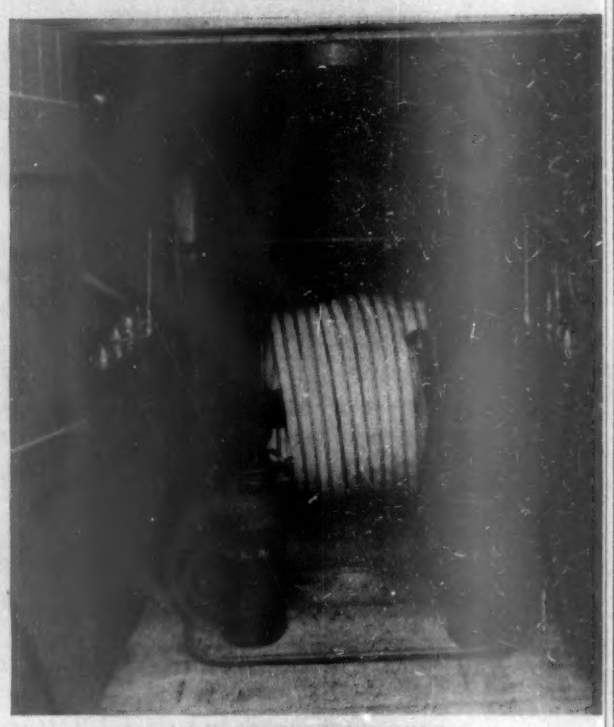
5. Drive home the fact that with management, labor, and the public working together, all Americans will continue to enjoy to the fullest degree all the best the American system has to offer.

The sponsors won't predict how long it will take to get the job done. Mass education, they point out, especially in a field like this one, is a slow process; it is never done. Right now, the men pushing the campaign are looking beyond next year, into the 1950's. They are sure American enterprise, once clearly understood, can be sold to almost everyone in this country—and that they will stay sold. To do this, the committee is counting on business and industry to help themselves.

In the ANA-AAAA view, understanding and conviction starts at home, at the plant and community level. Meet that situation and the national problem fades away.

Frequent inspections keep modern firefighting equipment ready for instant use . . .

. . . Whether the call is from the central station



. . . or the outside "garage"

FIREFIGHTING EQUIPMENT IN A MEDIUM-SIZED PLANT

Frequent inspections keep equipment in readiness to fight anything from a trash fire to a major blaze

A FULLY EQUIPPED, centrally located firefighting room helps provide The Parker Appliance Company, Cleveland, with good insurance against costly fires.

Equipment contained in the room is as follows: One low and two high ladders; talcum pails for extinguishing fires on machinery; gas masks; a respirator; blankets; a pulmotor; sprinkler heads, and wrenches with which to install them; fusible links for fire doors; lanterns; equipment to recharge extinguishers; an extinguisher service truck to haul out full extinguishers and return those in need of refill; raincoats; asbestos suits; and hand pumps.

The room also contains samples of combustible liquids used in the plant, with recorded data on volatility, flash points, and other information of value to firefighters. Located in a small, specially built garage just outside the main building is a hand truck on which a service length of hose is wound. A variety of nozzles and fire axes are also stored in this building.

All maintenance men have been trained in firefighting techniques, and are leaders of the fire protection groups into which the working force is organized.

ELECTRICAL MAINTENANCE RECORDS

CARL SCHULTZ • CHIEF ELECTRICIAN, AMERICAN CAN CO., JERSEY CITY PLANT, N. J.

HOW IS IT POSSIBLE FOR ONE MAN to supervise the innumerable activities of 3 electrical foremen, 35 electrical maintenance men, 1 stock clerk, and 1 record clerk at Canco?

Good control by a series of tried-and-proved paperwork techniques is the answer. And reports from workmen, where necessary, have been designed for easy execution by men who are repairmen and not bookkeepers.

The mere mention of paperwork in this kind of job makes many supervisors shudder. But let it be said that when paperwork has made the difference between chaos and orderliness, it deserves recognition.

The problem of electrical maintenance at Jersey City can best be illustrated by a few facts and figures. This is one of the largest of the company's 40-odd plants, embracing about 1,200,000 square feet of floor area in an 8-story steel and concrete building. Manufacturing processes and machinery are highly specialized. Most of the machinery is automatic. Complicated electrical controls are used widely, incorporating the latest electronic developments.

There are about 3200 active a.c. motors totaling 7000 connected horsepower. Utility power received at 4150 volts is reduced to 440 volts, 3-phase, for distribution. This spells maintenance of transformers in vaults, main switchboard controls, and distribution feeders to 77 power panels. Separate 120-volt lighting circuits involve some 6000 fixtures, mostly incandescent-type. Added to these are motor-generator sets and d.c. distribution for controls on all floors; motors on unit heaters, elevators, and ventilators; compressor motors; industrial battery-charging equipment; and several types of protective and signaling systems. Keeping all this equipment clean, properly adjusted, lubricated, and in good working order is obviously a man-size job. And 24-hour operation, 5 days a week, means less time to get at it, therefore careful planning against crippling shutdowns.

First objective of the electrical maintenance department is to keep machine downtime to a minimum. All other procedures and practices are built around this resolution. It is the final measure of the department's efficiency.

How to achieve this efficiency in practice involves several simple rules. All paperwork is designed to fix individual responsibility for the work done. Every man knows this. It challenges him to do a quality job in the least time. As a result, frequency of repair calls has been cut down.

Whenever possible, the same man is not assigned to the same repair job twice in succession. This gives a check on any mistakes through ignorance or oversight. Also, it eliminates carelessness, particularly in trouble diagnosis. As a final check on quality of workmanship, foremen continually inspect completed jobs at random.

There now follows a description of the paperwork by which these principles are implemented.

REPAIR CALL RECORD DATE May 10/48

		NAME
✓	611 EXHAUST FAN	BT
✓	# 13 PRESS TO BE REPAIRED	RAD
✓	358 PANEL TO BE REPAIRED	CB
✓	CHANGE MR. WYNN'S FILTER	RAD
✓	DISCONNECT MOTOR 63 SER 56-47	BT

1. REPAIR CALL RECORD. Repair calls are inevitable, even in a well-maintained plant. At Jersey City production supervisors either telephone or orally report their electrical repair calls to the chief electrician, who is available at his office most of the day. Every call, no matter how small the job involved, is entered on a repair call record.

This record is a continuous daily log (see above), begun each Monday, to which all subsequent days are appended. It shows the date assigned, the nature of the repair, and to whom assigned. Important calls are marked by a red arrow. No record is kept of job completion; it has been found unnecessary.

An average of 40 to 50 calls are received each day. This can be a distracting tempo. Therefore, all calls are screened through the storeskeeper in the nearby electrical stockroom. He lists the unimportant or less urgent calls (such as light replacement) but passes on the important ones to the chief electrician. The storeskeeper's list is brought in several times daily and stapled onto the office list. He may have assigned simple repairs in the meantime. A minor bulb replacement can be just as important to one supervisor as a major motor repair to another.

Having received the call, it is the chief electrician's responsibility to delegate the proper man to the repair, and promptly. No written orders are issued for repair work. If the maintenance electrician discovers the job is too big for him, a roving foreman is called to inspect the trouble and decide what action need be taken. Electrical foremen can be buzz-signaled over the plant-wide call system by a button at the chief electrician's desk, which cuts into the system regardless of other use at that moment. Foremen know this signal means emergency, and call back immediately.

On occasions the repairman reports back to the office to advise of repairs that might be better made at the next shutdown. This is entered either on the repair call record for a weekend assignment, or else on an active repair list kept departmentally for the purpose of accumulating such jobs until they can be conveniently done. The main point is, jobs are *never taken off the record until disposed of.*

THAT SIMPLIFY WORK CONTROL

Each Saturday the repair call record is reviewed for unassigned jobs, which are carried over to the following week's new list. Weekly lists are filed chronologically for a year.

In addition to the repair call record there is the familiar system of written orders and long-term construction orders covering installation of equipment ranging from new extension cords to major machine projects. Because they are well documented, the chances of overlooking one are slight. Not so with repair calls, however, which constitute a major part of the electrical maintenance work. The repair call record gets all the credit for keeping them straight.

	1947								1948	
ISOLATORS MAIN BRANCH	CK ● 1-26	CK ● 3-30	CK ● 5-4✱	CK ● 6-29	CK ● 8-11	CK ● 9-14		CK ● 11-30	CK ● 1-11	CK ● 2-8
OIL BREAKERS MAIN										
1940—1500 KVA.	CK ● 1-26	CK ● 3-30	CK ● 5-4✱	CK ● 6-29	CK ● 8-11	CK ● 9-14		CK ● 11-30	CK ● 1-11	CK ● 2-8
1934—1500 KVA.	〃	〃	〃	〃	〃	〃		〃	〃	〃
1928—1500 KVA.	〃	〃	〃	〃	〃	〃		〃	〃	〃
1928—300 KVA.	CK ● 1-26	CK ● 3-30	CK ● 5-4✱	CK ● 6-29	CK ● 8-11	CK ● 9-14		CK ● 11-30	CK ● 1-11	CK ● 2-8
1936—300 KVA.	〃	〃	〃	〃	〃	〃		〃	〃	〃
1946—600 KVA.	〃	〃	〃	〃	〃	〃		〃	〃	〃
AIR BREAKERS	CK ● 1-26	CK ● 3-30	CK ● 5-40	CK ● 6-29	CK ● 8-11	CK ● 9-14		CK ● 11-30	CK ● 1-11	CK ● 2-8
1936—300 KVA.	〃	〃	〃	〃	〃	〃		〃	〃	〃
1928—300 KVA.	〃	〃	〃	〃	〃	〃		〃	〃	〃

LEGEND

▬ INSTALLED
✱ TEST OIL
C CLEAN
● CHECKED AND OPENED
▲ REWIRED

2. PREVENTIVE MAINTENANCE RECORD. The preventive maintenance function has paid big dividends at Jersey City. It has avoided serious major breakdowns and revealed incipient troubles. It involves periodic inspection, cleaning, lubrication, and adjustment of all electrical equipment in the plant.

A single record in a loose-leaf ring binder controls all preventive maintenance activities. This record lists every function that needs periodic attention, and shows the date, type of last servicing, and initials of repairman. On the first page of this record is listed all primary electrical equipment, comprising the incoming lines and main switchboard. The next page lists in detail all large service units, such as compressor motors, generators, etc. A third page lists all general services and systems, such as fire-alarm, call bell, exit lights, stairway lights, sprinkler alarm systems, and guard switches. Subsequent pages list by departments and code letters the four main functions requiring maintenance: Motors *(M)*, lights *(L)*, unit heaters *(T)*, and gear-reduction motors *(GRM)*. These four functions have been conveniently grouped as such, rather than as individual motors or other units, for all-round simplification. No loss in effectiveness has been suffered thereby.

On each page of the record, the left-hand strip listing the electrical units is a permanent record. It is covered with a transparent plastic sheet for protection. This strip overlays the ruled page on the right, on which the service data are entered. The legend shows the type of service rendered. When one ruled page is filled, it is filed and replaced by a new blank. The left-hand column remains intact. All other pages are similarly arranged.

Every week, while posting the service data obtained from simple penciled reports from repairmen, the chief electrician reviews the record to see if and where preventive maintenance is falling behind. He

initiates work by an informal note to a repairman such as "Clean lights in department 35." When completed, the repairman sends back a signed note, "Finished cleaning lights in department 35." And so it goes with all items.

No attempt is made to indicate in the record the periodicity of service desired. It would make for more complicated records; moreover, this method is working satisfactorily. The standards of periodicity are a matter of "know-how" and have been set up on the combined basis of experience and trade practice.

Plant activity also is a factor in determining periodicity, as well as type of equipment. Gear-reduction motors, for example, must be checked for lubrication

LABOR SURVEY ELECTRICAL SHOP SHEET #1

NAME	M	C	DATE APRIL 19, 1948
CK	2	6	S-175-44-I-22 (3) S-40-48-I-5 (3)
HW	8		
JG		8	S-40-48-I-65A (8)
PK			
JP	7½	1	S-4-48-I-18 (1)
JB		8	S-40-48-I62A (1) S-40-48-I-(1)
TC	3	5	S-54-46-I-15 (5)
MS		8	S-40-48-I-5 (8)

LABOR SURVEY

NAME	DATE
CK	Q 719-54 3
HW	2A-54 ECR 1
JG	
PK	
JP	2B-44 EMR 1
JB	
TC	2A-75-13 ECR 3
MS	

3. DAILY LABOR REPORTS. Three types of daily reports show the chief electrician what his men are doing. These reports are made up by his clerk from the job time cards each man turns in for each job each day. No work is done without either a specific order for new construction or a standing order for repair work.

Sheet 1 of the series of labor reports shows how much time each man has spent on maintenance (*M*) or construction (*C*) work. In the wide space to the right, the construction work is detailed by order numbers and amount of time. The order numbers, of course, are familiar to the chief electrician. He can tell from the time distribution what is going on, he can watch how labor expense is running, and check for "overruns" on cost estimates. It is a good record for reference later on if any questions arise on work or efficiency.

Sheet 2 of the series goes further by showing a distribution of all labor charged to maintenance (*M*) on sheet 1. The coded standing orders are easily interpretable. Repairman *CK*, for example, worked 2 hours on order Q719 in department 54. *HW* worked 1 hour each in three departments servicing electric controls and stops (*ECR*), and 1 hour on starters and controllers (*ESR*), 1 hour on electric motor repair (*EMR*), and so on. The code numbers used are plant code account numbers for cost analysis on the basis of department, machine, and type of maintenance. A review of this record can be highly informative.

POWER DATA REPORT 1/31/48

FEEDER	DECEMBER	CHANGE	PRESENT LOAD	FEEDER	ALLOWABLE AMP. RATE	CONNECTED HORSEPOWER	LOAD AMPERAGE
PAB				PAB	720	446	624
PC	327	+16	343	PC	480	343	480
PDE				PDE	720	368	515
PFG				PFG	720	458	641
PHJ				PHJ	720	330	462
PKL	275	+72	347	PKL	720	347	486
PM	339	-1	338	PM	720	338	473

4. MONTHLY FEEDER LINE REPORT. As a part of general administration, every month a power feeder report of one-page size is made up to show the connected load on all power feeders. It points out possible overloads and alerts the chief electrician to check for unfavorable conditions.

Basis for making the feeder report is a report rendered by a repairman every time he installs or removes a motor at any location. This report shows by code designations on power panels the power feeder involved. Using the previous month's total on the feeder report as a starting point the net total of the changes is entered to derive the present load. Using a standard conversion factor of 1.4, the load amperage is calculated from the connected horsepower for comparison with the allowable ampere rate.

and condition of oil seals at least every 2 months; motors on continuously operated equipment, monthly; ball-bearing motors, semi-annually. In case of lights, one department may require twice the frequency of attention as another. In every case, the chief electrician makes a personal inspection to confirm the need shown by a 6- or 12-month lapse in the book.

ELECTRICAL SHOP — SHEET #2

APRIL 19, 1948

-526 -1	-527 -1	28-54 ESR	-533 EMR	-72-10 -1	-62-5 -2
-365 -4	2A-13-8 ECR ½	— 10 — 2			

Sheet 3 (not shown) details the activities of three full-time men assigned to service electric truck batteries. It is broken down into time spent in bringing in and distributing trucks; in changing batteries; checking batteries; washing, painting, and taping battery leads; and so forth. All batteries are numbered, and each man is responsible for one-third, by marked number.

These three labor reports are part of the company's general administrative procedures. They cost very little extra to get, and are invaluable for quick review to spot unfavorable trends or for later analysis in particular maintenance questions. When questions of past performance arise, they are answered by historical facts and not random conjectures.

NEW MOTORS INSTALLED REPORT

DATE 5/16/48

CANCO #	35928	HP. 1½
CIRCUIT NO.	#12-PC5	
SIZE CIR.	30 AMP.	
SIZE FUSE	10 A FUSETRON	
SIZE WIRE	#12	
MACHINE AND LINE WHICH MOTOR DRIVES	#537 LINE, FLANGER	

NAME C Kuzan

An excess in "load" amperage over "allowable" amperage does not necessarily mean an overload. Departmental diversity factors first must be checked and applied, because all machine lines are not running at one time. In case of any doubt, loads are checked by a split-core ammeter or by a recording wattmeter as the case may require. It is the simple feeder line report that inspires overload correction.

5. MOTOR RECORDS. Several records serve to keep tabs on all electric motors. A card record, filed by plant motor number, is kept in the electrical stockroom. Two separate but similar loose-leaf book records kept by the chief electrician show "active" and "spare" motors according to department. This cross-index is helpful.

Whenever a motor is returned to the shop for repair, a 5x8-in. buff clasp envelope is immediately attached to it and marked on the outside with motor data and reason for return. After repair, a simple, itemized, single-sheet form called "Motor Repair Record" is filled in by checking the parts repaired, date, and *initials* of repairman. This form is kept in the envelope, which is detached and filed in a special drawer by motor number. The date and initials are entered on the card record.

This routine serves as a check on what was done, and when, and places responsibility on the repairman. It has eliminated all confusion and irregularities in motor inventory.

6. OTHER RECORDS. The aforementioned records constitute the major controls specifically designed for the electrical maintenance department. Other routines of a familiar nature exist, of course, for requisitioning materials, purchasing and storing spare parts, etc., but they are commonplace. About 4000 electrical items are stocked and controlled by a perpetual inventory. Physical inventory is checked completely every 6 months, on fast-moving items every 2 months, and on important parts like coils and relays even more often.

Whenever any new equipment arrives, it is checked carefully for replacement parts, which are ordered immediately. The advantages of a well-regulated parts stockroom, however, are too important to be overlooked in making repairs quickly with least machine downtime.

Blueprint records of complicated electrical wiring and production lines and individual machines have proved worth while. These are filed in the chief electrician's office in large manila envelopes by department and unit. Each envelope is marked with its contents for quick reference. In case of trouble, the proper blueprint can be quickly located to help the repairman on the job. Repair time is cut substantially. These blueprints are brought up to date regularly to reflect the latest set-up. As new installations come along, they are added to the file.

Similarly helpful blueprints are kept in another file to show the plant's entire power and lighting layout, also riser diagrams to individual power panels. Instead of folding these large blueprints, they are kept flat in a shallow 3x5-ft. cabinet which is suspended waist-high on the wall. When in use, the cabinet can be swung into a horizontal position and propped up like an apartment-house ironing board. The top cover is then easily removed, and inside are neatly piled 30-odd flat blueprints ready for immediate inspection.

* * *

Presented in analytical review, the techniques in this article may seem to involve a lot of records. Taken one by one, each contributes a definite share to the department's efficiency. From a paperwork angle, any more would be too much, and any less not enough. That kind of paperwork has paid.

SCRAP, HOLD-UP, AND BREAKDOWN REPORT

JOB MACHINE SHOP HOLD-UP

DATE AUGUST 3, 1948

NATURE OF TROUBLE
(Quantity of scrap, hold-up, or machine breakdown)

Blown fuse causing hold-up and loss of time

EFFECT (Give loss in time and money)

Section of works blacked out and shut down for ten (10) minutes. Estimated cost: $12

CAUSE

Wires crossed in old bulb

These steps will be taken to prevent repetition

There is no way of preventing old bulbs blowing fuses but the following suggestion has been made to minimize loss of time. Out of ten minutes lost, eight were spent in hunting up the maintenance man, finding the fuse wire, and rewiring. It is therefore proposed that we standardize all our fuse holders and have a surplus already wired and available for replacement. One person will be responsible for seeing spares are always available

Signed J. S. Brown **Countersigned** Eric Rice

COMMENTS

This principle of having duplicates available and standardizing certain equipment is a good one. A number of machine belts are being duplicated and kept laced in readiness for a breakdown

SCRAP REPORT covers hold-ups and breakdowns as well. Foremen are required to give detailed information on each report. Foreman and worker responsible both sign report. Worker is asked for suggestions on prevention of repetition. A study of reports shows up careless workers

SCRAP REPORT CUTS SPOILAGE 73 PER CENT THE FIRST YEAR

Workers, old and new, are made conscious of the cost of scrap and breakdowns when this program is used to best advantage. Complete instructions are here

D. COMINO • MANAGING DIRECTOR, DEXION, LTD. LONDON, ENGLAND

IN THE TWELVE MONTHS since we introduced our scrap report system at Dexion, Ltd., we have reduced spoilage 73 per cent. Several of our friends have adopted the system, and in every case have made similar substantial savings.

With the plan we attempted to make our staff think, not vaguely, but in one well-defined direction—that of reducing scrap and waste.

Scrap and waste can nearly always be traced to errors of some kind—errors of judgment, errors of method, and so on. And so we concentrate our efforts on the elimination of errors: (1) Errors made for the first time by workers new to the job; (2) errors which regular workers keep on repeating. Our scrap report system attacks both groups. It sets out to make such a study of each error that:

1. All there is to be learned from it will be learned.

2. The individual at fault will be so deeply impressed that he is not likely to repeat his error.

3. All others will be given the opportunity of learning from it, so that they can profit from one another's mistakes.

Tackled in this way scrap reduction has become a fascinating and fairly profitable study.

How System Operates

We use one form only. Each time a job is scrapped, a breakage occurs on a machine, a serious error is made, or a long delay is encountered, the foreman makes out a scrap report. He does it in consultation with the worker concerned. Forms are prepared in triplicate. One copy is handed to the worker; one is retained by the foreman; the third is sent to the office.

At this point it must be emphasized that it is not the object of this system to fix the blame or find a scapegoat for everything that goes wrong. On the contrary, just as a doctor patiently and sympathetically seeks to enlist the cooperation of a patient in curing an illness, so we seek the cooperation of those responsible for scrap and secure their help in reducing it.

How to Make Out Report

Nature of the trouble. Fill in with sufficient detail to allow an analysis to be made at a later date. For example, in a machine breakdown, state which machine was involved; a subsequent study may

show that certain machines are costing more in repairs and replacements than is justified by their output.

Effect. Give loss in time and money. This impresses the person responsible for the scrap with the magnitude of his lapse in terms of hard cash. He is likely to ponder a little when it is brought home to him that his error cost the firm the equivalent of his week's wages. It is a well-known fact that employees have little conception of what their carelessness costs, especially if they know that no check is being kept of their individual record.

If this entry is accurate, it can be used at the end of a given period to get a total of the loss occasioned through scrap.

The entry may be further analyzed to show amount of scrap for each worker, each department, each machine, etc.

Cause. Under this heading enter the circumstances that led to the scrap. And here it would be well to sound a warning. It is a great temptation to be a little lazy and give some superficial and generalized reason, such as "carelessness." We all know that most scrap is due to carelessness, but if we are to do anything about it we must go into the matter far more analytically and determine of what the carelessness consisted.

These steps will be taken to avoid repetition. This, perhaps, is the most important section of the report. Never dismiss it with some vague remarks such as, "More care will be taken in the future." Work out a positive solution. The greater the amount of time and care expended in finding proper solutions for your problems, the greater will be the success of the system, and the fewer reports it will be necessary to make.

This section is important because the mere fact of having to fill it in indicates that something has been learned from the mistake. It places the emphasis on prevention rather than cure, and tends to develop a corresponding habit of mind. In many firms the attitude to scrap is only too often: "How shall we make the best of a bad job?" "How can we patch it up?" When emphasis is placed on salvage rather than on prevention, the way is left open for repetition of the mishap.

Signature of person responsible. It tends to increase the sense of responsibility if a signature is obtained, but no pressure should be applied. Cooperation is essential to the success of the system, and more harm than good would come of antagonizing individuals.

Where it is difficult to fix responsibility, several names may be put down. It is always wise, when it is at all possible, to give the worker the benefit of the doubt.

How to Get Most Out of System

1. Go after the minor errors. To begin with, it is probably a good idea to make out scrap reports only for the most serious errors, then gradually as these are cut down to enlarge the scope and take in minor lapses as well. When a scrap report has to be made out, consult the individual responsible and encourage him to make suggestions. Pin a copy of the report on the bulletin board so that others may have an opportunity to learn about the mistake that has been made.

2. Weed out careless workers. Some workers are accident-prone. Others are consistently careless. Records in one firm showed that 10 per cent of its clerical staff was responsible for 70 per cent of the mistakes. In another plant, 5 of the 35 workers were responsible for 60 per cent of the breakages on the machines. Analysis of scrap reports over a period shows which workers are for one reason or another unsuitable for their work. Conversely, it is likely to bring out some who are individuals worthy of promotion.

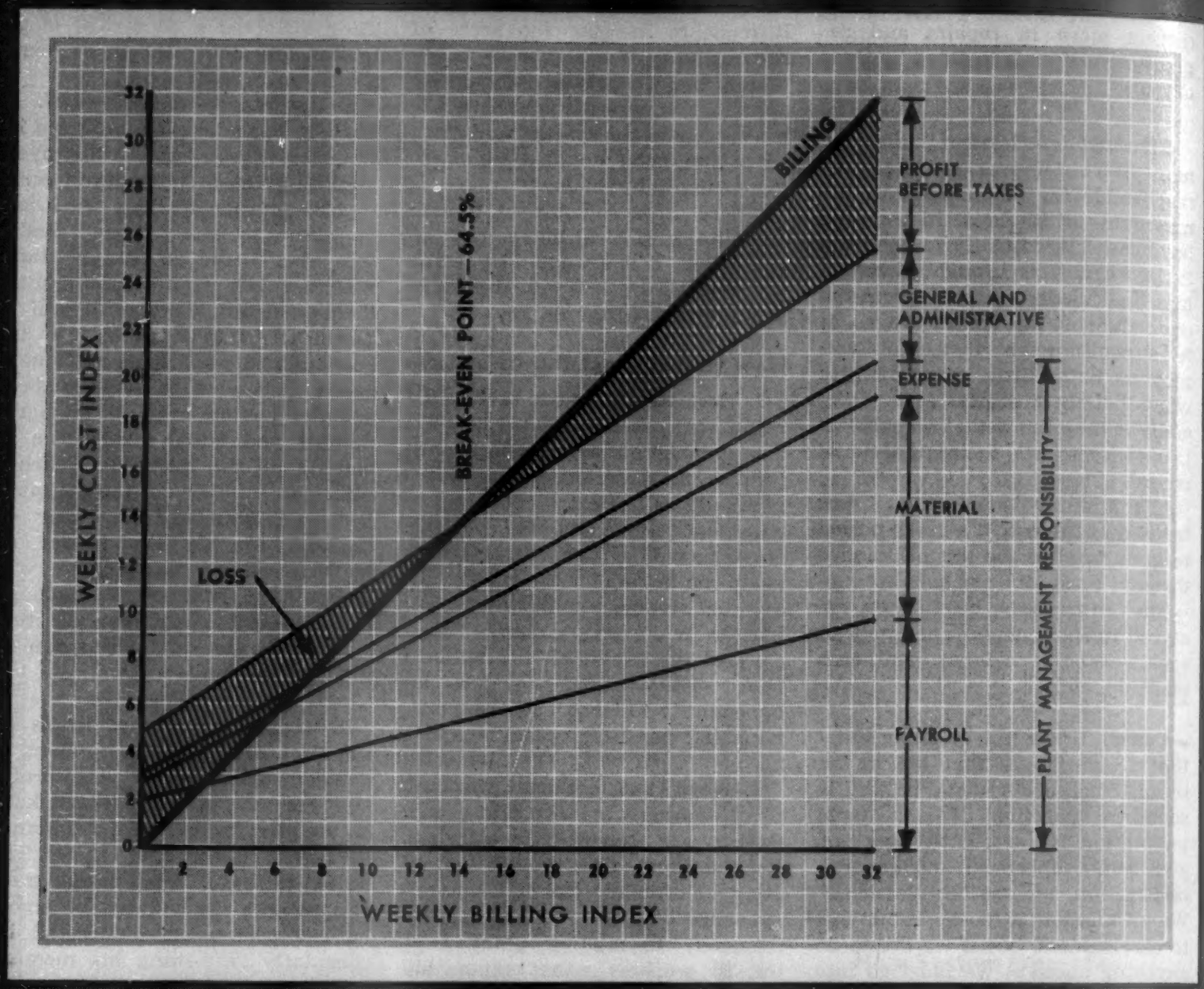
3. Keep a check on machines. An analysis of scrap reports will show which machines are repeatedly breaking down or causing holdups.

4. Write instruction sheets. From the analysis of reports, it has been found that as much as 80 per cent of scrap and waste may be due to half a dozen causes. It is then possible to draw up brief instruction sheets warning workers against these pitfalls. For example, in one machine shop it was found that 35 per cent of the hold-ups could be traced to inadequate and careless oiling. Instruction sheets were therefore drawn up and demonstrations made, with notable results. Notices were hung up all over the shop reminding workers about oiling up. Some were in rhyme; others had humorous sketches. They attracted a good deal of attention and drove the point home.

5. Use reports to train staff. In addition to the above-mentioned instruction sheets, new employees may be given a collection of scrap reports relating to their work and be asked to study them. Better still, they could go through them with a senior who would explain them in detail. The result will be that a new worker profits from the accumulated experience of others, and knows what to avoid without actually having to go through the painful and costly experience of making all the mistakes. When a sufficient number of reports have been accumulated, they may be bound up roughly into a binder and made available to anyone who wishes to study them. Occasionally it may be possible to give a lecture or hold an informal discussion on the basis of these reports.

7. Keep departmental heads on the alert. A supervisor, foreman, or department head can very profitably refresh his memory and keep on the alert by an occasional glance through a collection of reports. The writer has been amazed and gratified to note the number of errors he has been able to forestall by constantly refreshing his memory in this way. A sort of new sense is developed by which it is possible to foresee where trouble is to be expected and so forestall it. In fact, it is no exaggeration at all to say that, if the scrap report system were used for nothing more than making executives and foremen more alert, it would still be well worth while.

8. Encourage suggestions. Many successful suggestion schemes are based on the principle of putting up definite problems and asking workers to suggest solutions. This gives the employees something definite on which to concentrate and prevents their wasting time on unimportant and sometimes frivolous ideas which, to their everlasting discouragement, management inevitably turns down. The scrap report system brings up an endless stream of problems, big and little, most of which the workers come across frequently in their work. Their problems are ideal material to be worked on by all and sundry. And we have found that valuable suggestions will be made.



VARIABLE BUDGET DIAGRAM INDICATES MANAGEMENT RESPONSIBILITY FOR CONTROL OF TOTAL COST OF PAYROLL, MATERIALS, AND EXPENSE

VARIABLE BUDGET CONTROL IS

Improvement in operating cost has absorbed a general wage increase, the rise in material cost, and, at the same time, has lowered the break-even point

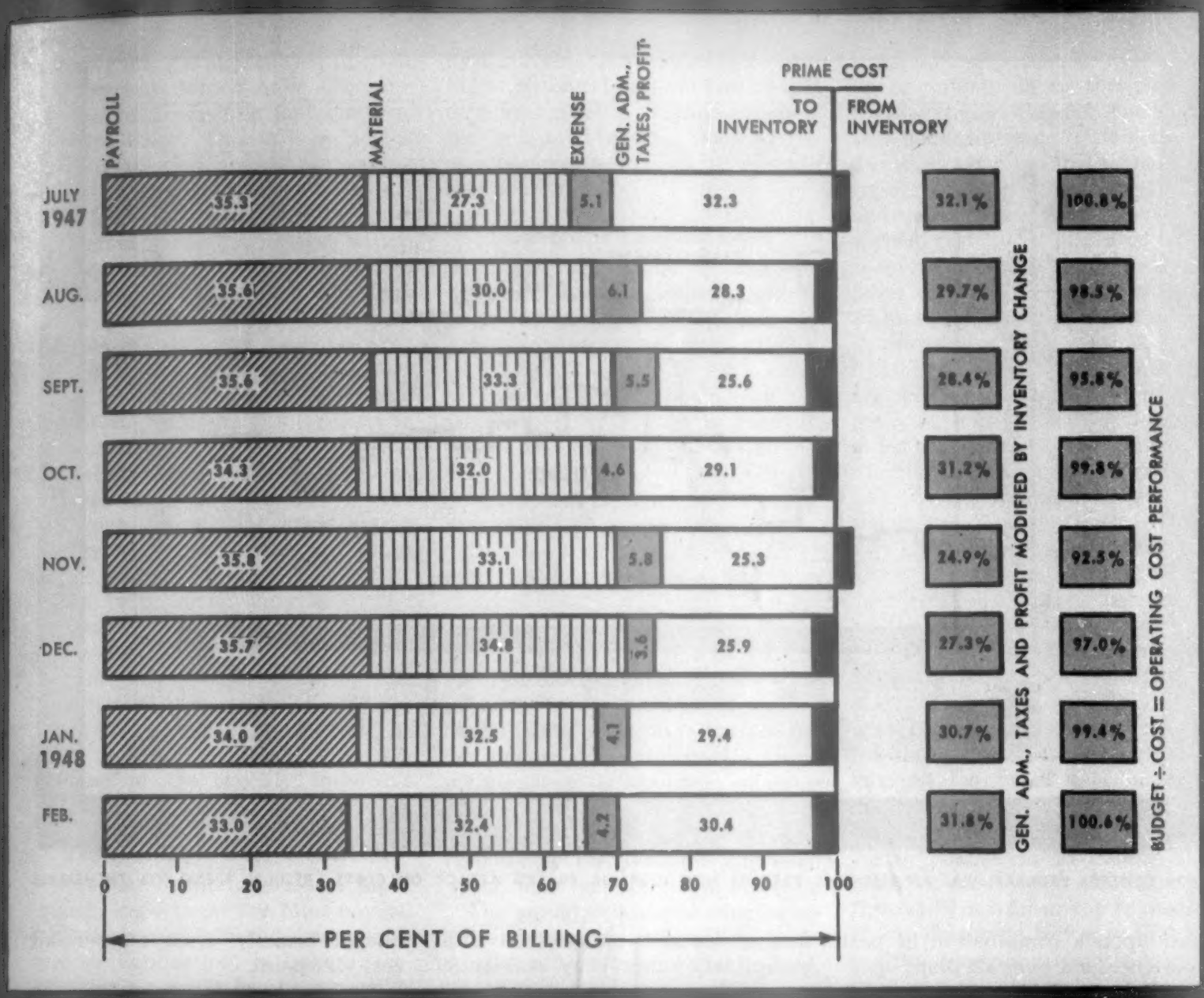
R. G. HESS • DIRECTOR OF WAGES, METHODS, AND BUDGET, THE NEW YORK AIR BRAKE COMPANY, WATERTOWN, N. Y.

HIGH PROFITS ARE BEING MADE today because volume is high. But what will happen to profits with a decrease in volume? Where is your break-even point, and what are the cost factors that have made it rise? What can be done to prepare your company to weather the storm that is sure to arise sooner or later?

To answer these questions requires the development of a systematic plan of action.

Actual operation of such a plan at The New York Air Brake Company has obtained definite results in plant operating cost performance. In 14 months—measured at the same selling price level—the improvement in operating cost has absorbed a 7 per cent general wage increase, a 12.75 per cent increase in material cost, and at the same time has moved the break-even point from 64.5 to 62 per cent of normal plant capacity.

The first step in developing a plan of management control of operating costs was recognition that the normal accounting reports are not sufficient to meet the needs of plant management. For example, the



MANAGEMENT'S PERFORMANCE IN CONTROLLING TOTAL COST OF THREE ITEMS IS MEASURED AGAINST VARIABLE BUDGET OVER SEVEN MONTHS

KEY TO COST REDUCTION

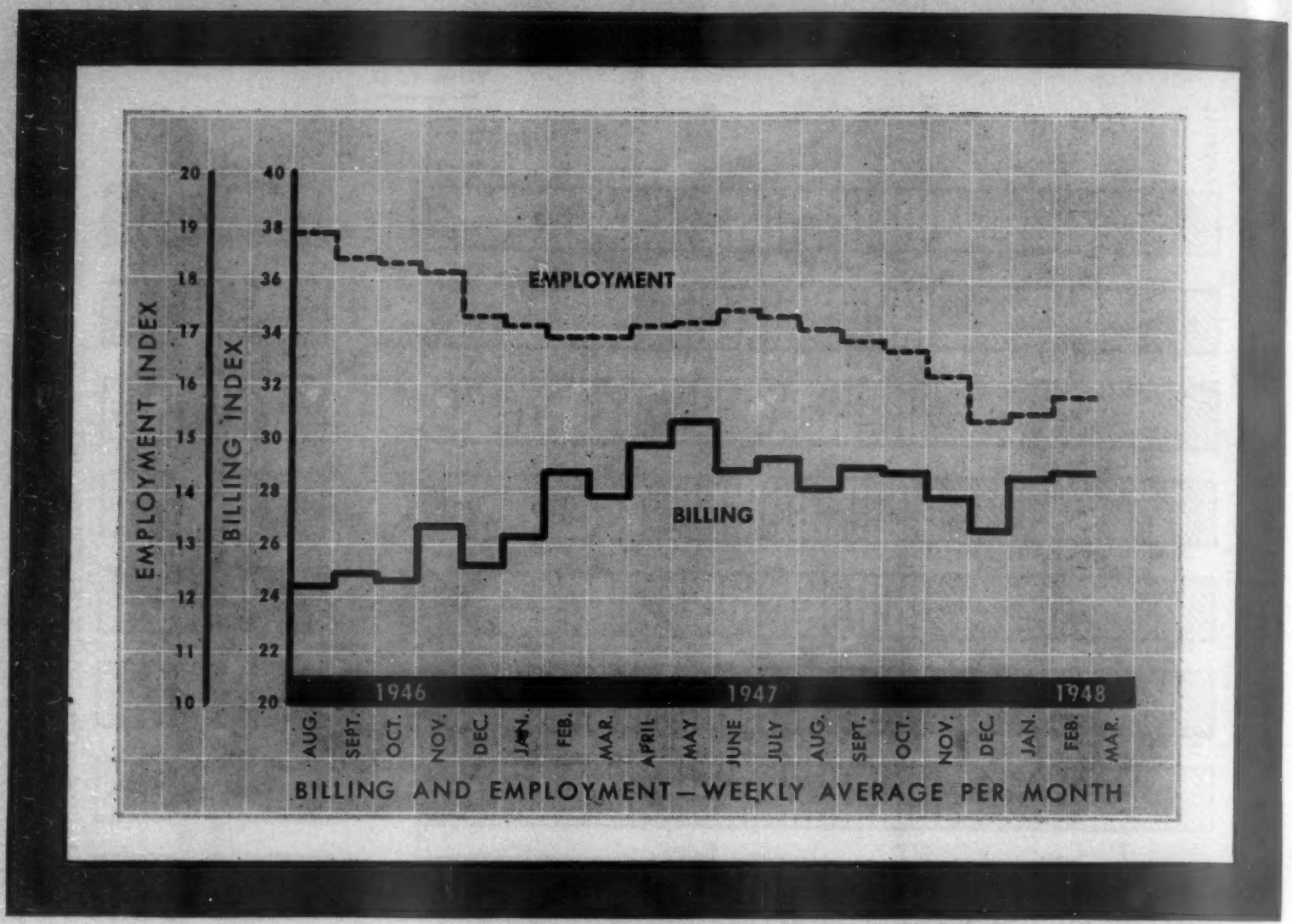
term "prime cost" from the accounting report is almost meaningless when applied to plant cost control. It must be expressed as labor cost which can be translated into people on the payroll, and as material cost which can be measured in terms of storerooms requisitions. With these terms translated into such language, the plant manager can then apply himself to the problem from the viewpoint of actual control.

Need for Break-Even Chart

For the most direct approach to the problem of cost control, the manager requires a carefully prepared plant break-even chart showing not merely the over-all plant cost plotted against volume of billing, but also the three major plant cost factors of payroll, material, and expense—measured against volume of billing for a definite billing-dollar content. A knowledge of the billing-dollar content for any given period under study is essential. When more than one product is made, each has its own individual cost characteristics, and a resultant profit factor different from that of any other product.

Since the content of the billing dollar is one of the prime factors underlying profit performance, and since the billing dollar is completely dependent upon sales, the *sales forecast* becomes the first step in the preparation of the anticipated plant operating cost break-even chart. Through market analysis, customer contact, or other available procedures, the sales department must not only predict the over-all amount of business, expressed in dollars of sales, but must also forecast the activity, in per cent of the sales dollar, for each major product.

Starting with the sales forecast, the break-even chart is prepared,



LABOR CONTROL PROGRAM WAS AN ESSENTIAL PART OF NEW YORK AIR BRAKE'S ATTACK ON COSTS. RESULTS SPEAK FOR THEMSELVES

based upon a combination of past experience and over-all plant operating judgment. If, as in the period immediately following World War II, it is recognized that many inefficiencies have crept into plant operation, the effect of such inefficiencies will be estimated in preparing the chart. Therefore, the chart becomes an operating goal, rather than a picture of existing conditions.

It will be noted that the labor cost is shown as total plant payroll. This is not done to minimize the importance of controlling non-productive labor as a single factor of cost, but to prevent a false record of improvement where budget pressure on non-productive labor forces it down with a corresponding increase in productive labor. This may be done deliberately or not, but it does happen. By placing the budget pressure on total payroll, the results in labor cost control are positive. There is no other place for labor cost to enter.

However, just as pressure on non-productive labor alone may increase productive labor cost, pressure on total payroll alone can increase material costs. The line supervisor, finding himself pinched on total payroll allowance, may seek relief by developing reasons to purchase certain items normally manufactured. If an improvement in payroll cost results in a corresponding or even greater increase in material cost, nothing has been gained. So on top of total payroll allowance is placed total material allowance, and on top of total material allowance is placed total plant expense allowance. (The plant manager normally has no control over general administrative expense, although it is shown on the chart as a guide.)

Operating Within Budget

Within the limits of the activity provided by sales, management's problem becomes one of operating the plant within the total budget allowance. If it can effect a cost saving by manufacturing an item now purchased, this should definitely be done. Such action may overrun the payroll budget but the saving in material will more than offset the payroll variance and bring down the over-all plant cost. To achieve maximum results, it is necesssary that plant operating management be given the authority to apply the budget broadly, from an over-all cost viewpoint.

The manager must analyze the existing costs of operation as compared with the budget allowance and plan his cost reduction program accordingly. This is not a one-man job. Each department head and supervisor must understand the objective and lend full cooperation.

First comes a complete study of the payroll, department by department and job by job. If a job is determined unessential, it must be abolished immediately. Possibly some small departments may be combined, with a reduction in supervisory cost. To assist in this study, a weekly payroll analysis sheet is made available to all foremen and department heads. The allocation of total payroll allowance by departments must be done with a thorough knowledge and consideration of the current operating problems of each department. Weekly progress meetings with superintendents and foremen, for review, discussion, and planned action, are essential. At these meetings it is necessary to scrutinize, also, the per cent of output not salable due to whatever cause.

After the total payroll control is in effect, the problem of non-productive labor is approached in those departments which have a combination of productive and non-productive labor. This is done as the second step to assure cost-saving results. A reduction in non-productive labor will then show either a reduction in total labor cost within the department or must result in greater productivity (more billing) from that department. Losses on salable material can be considered as worse than non-productive since such loss involves both labor and material. To assist the foremen in non-productive labor cost control, a weekly budget progress report, called a labor statement, is provided for each department. This report shows the non-productive allowance based upon productive activity, actual non-productive cost budget variance, ratio of non-productive to productive for the current week and the immediately past week, and cumulative progress to date for the year. This departmental report is used by the superintendent for discussion at the weekly foremen's meeting.

Total Labor Cost Reduced

The net result of the two labor budget reports on the total payroll and the non-productive labor, with proper application, is either a reduction in payroll for the same billing produced, or greater billing with the same payroll. In either case, the total labor cost per dollar of billing is reduced. Supplementing the control of labor costs through use of the variable budget is the normal and continuous methods improvement program.

Just as the manager is given authority to re-allocate his over-all allowance between material, payroll, and expense, the superintendent is given authority to transfer his over-all allowance among departments in moves that will result in net saving. Such re-allocation is made in conjunction with and under the general direction of the budget department.

As the entire organization becomes familiar with, and responsible for, controlled operations, the need for controlled hiring becomes apparent. Requests for hiring additional employees are carefully reviewed jointly by the superintendent, the production planning supervisor, and the budget director. With only unusual exceptions, the increased payroll resulting from increased employment must be covered within the budget allowance by a corresponding increase in billing or potential billing. The budget director approves the hiring request before it may be acted upon by the employment section of the personnel department.

Controlled Hiring Pays

As an experiment to test the wisdom of controlled hiring, a study was made over a short time interval covering a reduction in productive activity followed by an increase to the normal level. Considering the number of employees laid off to set the reduced schedule as 100 per cent, only 55 per cent were rehired on a controlled basis to meet the resumption of normal activity.

One important factor in labor costs is the control and elimination of unnecessary overtime. It must be recognized that unless machine capacity on straight time is exceeded, overtime payment serves only as a penalty. In the case of maintenance labor, only after exhausting all possibilities of straight time maintenance is overtime maintenance permitted. In the plan described, the budget director is responsible for overtime approval, which may be obtained in advance.

The actual relative change in total employment and billing from August, 1946, to February, 1948, under the labor-cost control plan is shown in the accompanying charts. With a 16.5 per cent decrease in employment, billing was increased 18.2 per cent.

In addition to the normal waste-control program to reduce the cost of material and plant expense, such costs are carefully studied from the viewpoint of plant manufacturing *versus* purchasing. This study is based on the theory that all items that can be manufactured at a cost equal to the purchase price should be manufactured in the plant. A review of purchased material costs will show up items that are being purchased that could be manufactured at a saving in over-all cost, and at the same time provide jobs for the employees displaced by the labor cost control system. From a labor relations viewpoint, as well as from a cost viewpoint, this is highly desirable.

An important tool in the cost control program is the plant monthly progress report and performance index. This report is submitted to the plant manager for his guidance. The plant manager then sends this report to the operating vice-president or president with his comments as a complete record of plant operating cost performance for the month. This report supplements the normal profit-and-loss statement.

In constructing the monthly progress report, the costs and billing are based on an average week during the month. In this manner the varying length of each month is compensated to make each report directly comparable with another.

The change in inventory value must be reflected before true performance measurement is possible. It is not enough to know that during the month a certain billing was produced in sales value shipped; it is also necessary to determine increased or decreased inventory value during the month, and the dollar value of the change.

Performance Report

Described briefly, the monthly operating cost performance report shows the total payroll expended, the total cost of material used, and the total plant expense, expressed as a weekly average. The summation of these three items, modified by the prime cost change in inventory value, represents the true weekly plant operating cost for the month, shown graphically in the chart. The weekly dollar value of billing produced during the month determines (from the budget curves) the total plant operating cost budget allowance. The ratio of total budget allowance to total operating cost, modified by inventory change, is the "Operating Cost Performance Index." This index is the manager's measure of the effectiveness of his cost control program and it covers all items over which he has control responsibility.

Every Month . . .

AMONG THE ADVERTISING PAGES, these valuable aids to low-cost production: the plant operation man's guide to **WHAT'S NEW IN EQUIPMENT** (page 136) . . . a summary of **LABOR DEVELOPMENTS** (page 228) . . . things **YOU WANT TO KNOW** more about (page 216)

CAPACITORS—WHY AND WHERE

Part II. Conditions that must be taken into account when applying shunt capacitors for power factor correction, with data that will be of help in determining the capacity required

HAMILTON BROOKS • SWITCHGEAR AND CONTROL DIVISION, WESTINGHOUSE ELECTRIC CORPORATION, EAST PITTSBURGH

IF CAPACITORS are installed on individual machines to supply all the kvars. required, at any one time there will be many capacitors not in use. Otherwise, an excess of kvars. would be supplied. For a large plant, therefore, or for a connected load of considerable diversity, it is necessary to consider the kvar. requirements of the plant as a whole in determining the number of capacitors to be installed.

Table II shows the type of load and the power requirements of a typical plant of moderate size, fabricating metal parts. It was determined, after a study of the power billings and consultation with the power company, that the average power factor should be raised to 95 per cent. The problem was to find the kvars. of capacitors and their disposition in the plant to do this most economically.

As mentioned before, it is not economical to supply the kvars. by a large number of small capacitors connected at the individual loads. Also, it may not be economical to do the job with one large capacitor connected at periods of heavy load. What should be done is to analyze the load and segregate it into groups to determine where the capacitors may be operated for the most hours per month. To this end the analysis in Table III was made.

There is a small weekend load with a relatively large kvar. caused predominately by magnetizing current taken by the lightly loaded transformers. A permanently connected capacitor may safely be applied to correct this load to 100 per cent, and over a month it will pile up more than a third of the kvar.-hours needed for the whole plant. Similarly, a capacitor large enough to correct the small night or early morning shift load may be operated continuously except for weekends. It accumulates a good share of the remaining kvar.-hours needed. Repeating the process for the heavier early evening load takes care of practically all of the capacitors required.

VALUABLE FLOOR SPACE was saved by mounting this 60-kva. capacitor on the ceiling. It is switched on and off by a voltage-operated relay

To take care of the daytime load, a 15-kvar. capacitor may be connected to some individual machine used only during daytime operation. It should be switched on and off with the motor to which it is connected.

By this method of analysis it is possible to find the smallest number of capacitors that will accomplish the desired results.

The flexibility of capacitor equipment does not suffer from the high degree of standardization because of the unit type of design. The user therefore has a wide choice of ratings and mounting arrangements. Table IV shows briefly the various types of capacitors from which a selection may be made.

In the preceding example, it was found that a 105-kvar. capacitor could be permanently connected. This capacitor might well be a group of seven 15-kvar. three-phase outdoor capacitor units pole-mounted from a cross arm and connected to the incoming line. Capacitors of this type are available up to 13,800 volts. Such a group requires no housing, foundation, or circuit breaker, but only two simple angle-iron brackets and a set of disconnecting fuses to complete the installation. If the desired location is indoors, or if frequent switching will be required, seven 15-kvar. indoor units may be mounted in a standard sheet-metal housing and provided with a circuit breaker integral with the capacitor.

The 90-kvar. capacitor needed for the night load probably would best be an enclosed or dust-tight design placed near the center of this load. It would likely be of 230 or 460 volts rating. Such a capacitor occupies little space and needs no special foundation. In fact it may be suspended from the ceiling if desired. The weekly switching operation could be done with an air circuit breaker or safety switch.

The 270-kvar. capacitor used with

TABLE II • LOAD ANALYSIS OF A METAL FABRICATING PLANT

CONNECTED LOAD	KILOWATTS
Induction motors (2250 hp.)	1975
Resistance heaters, ovens	460
Lighting	200
Arc welders	15
Resistance welders	35
Induction furnace (supplied through m-g. set)	50
TOTAL	2735

Highest maximum demand (30 min.)	1065
Power factor of normal load	0.66
Average power factor per month	0.68
Demand factor (1065 ÷ 2735)	0.39

	Kilowatts	Kva.	Power factor
Average day load	865	1310	0.66
Average evening load	575	810	0.71
Average night load	234	304	0.77
Average weekend load	58	116	0.50
Average monthly load	382	562	0.68

LOAD FACTOR (382 ÷ 1065) = 0.36

TABLE III • CALCULATION OF KILOVARS FOR LOAD IN TABLE II

PERIOD	BREAKDOWN OF AVERAGE MONTHLY LOAD						CAPACITOR REQUIRED		
	Kw.	P.f.	Kvars.	Hours	Kw.-Hrs.	Kvar.-Hrs.	Kvars.	Hr./Mo.	Kvar.-Hrs.
Weekend	58	0.50	99	240	13,900	23,760	105	720	75,600
Night	234	0.77	194	170	39,800	32,980	90	480	43,200
Evening	575	0.71	575	160	92,000	92,000	270	310	83,700
Day	865	0.66	990	150	129,700	148,500	15	150	2,250
TOTAL					275,400	297,240	480		204,750

Kilovar.-hours per month at 0.68 p.f.	297,240
Kilovar.-hours per month at 0.95 p.f.	92,000
Difference to be supplied by capacitors	205,240

TABLE IV. TYPES, CHARACTERISTICS, AND APPLICATIONS OF CAPACITORS

TYPE OF EQUIPMENT	APPLICATION	KILOVAR RANGE[1]	VOLTAGE RANGE	WEIGHT PER KVAR., POUNDS	RELATIVE COST[2]
Enclosed units	Individual machines or small plants	1, 2, 5, 10, 15	230, 460, 575	4¼	115
Outdoor units	Pole mounting at service entrance. May be grouped 12 to a pole	5, 10, 15 15, 25 15	230, 460, 575 2400 to 7960 12,470 to 13,800	3½	100
Enclosed racks	For load centers or small plants	30 to 90	230, 460, 575	5¼	115
Small indoor racks		45 to 180	230 to 7200	5½	115
Small outdoor racks		45 to 180	230 to 7200	6½	125
Large indoor racks	For large group correction. May be sectionalized and controlled automatically	360 to 2520	230 to 13,800	5½	110
Large outdoor racks		260 to 2520	230 to 13,800	6	120

1. 230-volt ratings are one-half the kvars. shown

2. Weight and cost also vary with voltage class and with accessories such as automatic control

the early evening load might well be the same type of equipment as the 90-kvar. unit. It could be grouped at one location or spread about the plant in smaller units if it is desired to obtain the full advantage of reduced line currents and improved voltage regulation.

Some plants prefer to install one large, centrally located capacitor bank equipped with automatic control that switches on sections as needed, instead of applying units as determined here. The control may be arranged to operate from line current or to be actuated when the voltage drops below a selected value.

Such an installation has the advantages of maintaining the proper number of capacitors on the circuit without dependence on manual operation. It has the disadvantage of not applying the correction as close to the source as smaller groups dispersed throughout the plant.

Not to be overlooked in selecting capacitors is the relative cost of the installation. Capacitor installation costs usually are low when compared to heavy machinery requiring foundations or vaults. Nevertheless a 300- or 600-kvar. capacitor installation is still a construction project requiring conduit, cables, and a wiring crew. In contrast, 15-, 30-, or even 60-kvar. equipments are light, and simple to connect. Installation often may be handled by the plant electricians.

Final selection of a capacitor is largely a matter of common sense guided by the particular conditions in the plant and what it is desired to accomplish.

Jobs for Series Capacitors

What has been said so far applies particularly to shunt capacitors, which are by far the most important used on industrial circuits. Some specific conditions however are corrected by series-connected capacitors. For example, some of the largest series capacitors in industry are used to neutralize the reactance in the busbars feeding graphitizing furnaces. The capacitors are connected in series with the busbars through current transformers. The size of capacitor is chosen to offset the inductance in the bus. Only by this means could the voltage drop caused by the very heavy currents be reduced and economical operating conditions obtained.

Series capacitors frequently are used with resistance welders, primarily to reduce the inrush current and eliminate objectionable light flicker. Such installations require careful coordination with the welding machine manufacturer, and are best made as part of the original installation.

In general, a series capacitor application is not such a relatively simple problem as with a shunt capacitor. If it is remembered, however, that the series capacitor is used to neutralize circuit reactance and reduce voltage drop, the need for it can be recognized. The application problems may be put up to the capacitor manufacturer.

Capacitors are obtainable in weatherproof, dust-tight, and open construction, but the modifications between types are simple. The type best suited may be selected with little penalty in cost.

Locations subjecting the equipment to severe vibration, or to extremely corrosive atmospheres, are to be avoided, but such precautions are equally necessary for any electrical equipment.

Attention to temperature and ventilation conditions is important. The efficiency of a capacitor is about 99.7 per cent. It is one of the factors that permits a large amount of kvars. to be packed into a small volume. Since the temperature rise is small and there are no moving parts, the capacitor depends on natural air circulation to get rid of the little amount of heat liberated. Because of the low temperature

rise, a capacitor may pick up heat by radiation from surrounding surfaces or nearby equipments that have a higher temperature.

Therefore, capacitors should not be placed in drying rooms, or mounted over apparatus that liberates a large amount of heat. Neither should they be located in dead air under a roof or in a corner, without provision for air movement. Because of the influence of surrounding surfaces on capacitor cooling, the usual 40 deg. C. ambient temperature limitation must be considered as referring to nearby surface temperatures as well as air temperature.

In a practical sense, capacitors can be overloaded only by application of a voltage or frequency beyond the rating. The standard permissible voltage tolerance of 5 per cent for 24-hour average and 10 per cent for short-time durations has been found ample for the usual industrial circuit.

The variation of frequency in modern power systems is insignificant. The only possible overload is from harmonic frequencies that produce a badly distorted wave form. Harmful harmonic overloading, however, is infrequent. A current-carrying margin of 35 per cent or better usually is provided in the capacitors and their associated wiring and accessories. Excessive current flow can readily be observed when the capacitor is first connected, and remedial measures taken if necessary.

The connection of a capacitor to the circuit naturally results in a large momentary inrush of charging current. Fuse ratings and circuit breaker settings are selected to carry this transient current without opening. For this reason, and since there is little necessity for overload protection, the protective devices are chosen to remove the capacitor from the circuit in the event of a fault, rather than for overload protection. A fuse rating of about double the normal capacitor current is safe from blowing on switching transients.

Few precautions are required in the operation of a capacitor. Large capacitor banks should not be left connected to lightly loaded circuits, because the flow of excessive kvars. from the bank may raise the circuit voltage beyond the permissible tolerance for lamps and other equipment, as well as that of the capacitor. This contingency can easily be taken care of when the installation is made by careful grouping with respect to the various loads. Each group ought to be connected and disconnected according to a prearranged schedule.

The automatically switched capacitor determines for itself the time for switching on or off.

A very economical installation is possible when the capacitor can be associated with the operation of a particular motor and switched on or off with it by the same control. Then the size of the capacitor should not be greater than necessary to supply the exciting kvars. required. If the capacitor is large compared to the kvars. used by the motor and is left connected to its terminals when power is shut off, the motor will operate temporarily as an overexcited generator and may produce damaging overvoltage before the rotor speed dies down.

TO MEASURE POWER CONSUMPTION IS TO ECONOMIZE

DAVID MOFFAT MYERS • MYERS, FULLER & ADDINGTON
NEW YORK

IF MY MEMORY SERVES ME correctly, it was Pascal who said, "To measure is to economize." The corollary is equally true, "Not to measure is to waste."

As usual, I am thinking about steam and power in industry. How all efficient plants maintain their economy of operation by continuous measurement is admirable. And how all the inefficient plants remain wasteful because they fail to measure is really not admirable at all.

How much of an item is this power, heat, and light cost in industry? Is it worth accounting for?

It has been estimated that in a good business year this expense item may be 60 per cent of distributed earnings. Thus, if power, heat, and light were reduced one-sixth, distributed earnings could be increased 10 per cent. If the reduction in cost were only 8 1/3 per cent, the earnings would be increased 5 per cent. So I think those two questions are answered.

No sane industrialist runs his business without some accounting system. Yet this important business inside of a business is too often allowed to run itself with no accounting for returns as against expenditures.

The accounting should be in terms of heat, fuel, steam, kilowatt-hours, and some analyses and temperatures. All these are simply other words for dollars. Proper accounting tells where they are going and why.

Primarily, suitable instruments and records tell whether proper ratios are being maintained. For instance steam per pound of fuel; steam and fuel and kilowatt-hours per unit of production; peak demands against average load, boiler output against most efficient loading, the ratio of kw. to kva. (power factor); and as many more as conditions justify. Metering and charging steam and electricity to separate departments are often productive of important savings.

Comparison of these ratios with the par values, which can be set up for any plant, provides a continuous check against waste. A plant without its essential instruments and records is like a man without eyes. It runs blindly and always wastefully.

Plant and operating engineers are always pleased to be given the necessary instruments to enable them to secure and maintain efficient operation. Provision must be made to keep the records and meters in order and, above all, to insure their useful application.

It is a wonderful stimulus to an engineer if the management shows enough interest to confer with him intelligently, with real records to go by. This should be done at regular, stated intervals, not just spasmodically or when management is in a jam.

The efficiency of any given plant is in direct proportion to the skill of its operation. Instruments and records are essential to, and a part of, operation. Thus it is that without capital expenditure many an old plant, and some not so old, can be boosted up to their top possible efficiency, and at a saving that will repay the cost of instruments many times over the first year.

OPERATING SHORTS

Readers are invited to contribute brief articles, illustrated when possible, reporting out-of-the-ordinary operating accomplishment. Accepted articles will be paid for

Sliding Die Racks Save Time, Fatigue

Die storage racks, with sliding shelves (arrow), save time and reduce worker effort at Harnischfeger Corporation, Milwaukee.

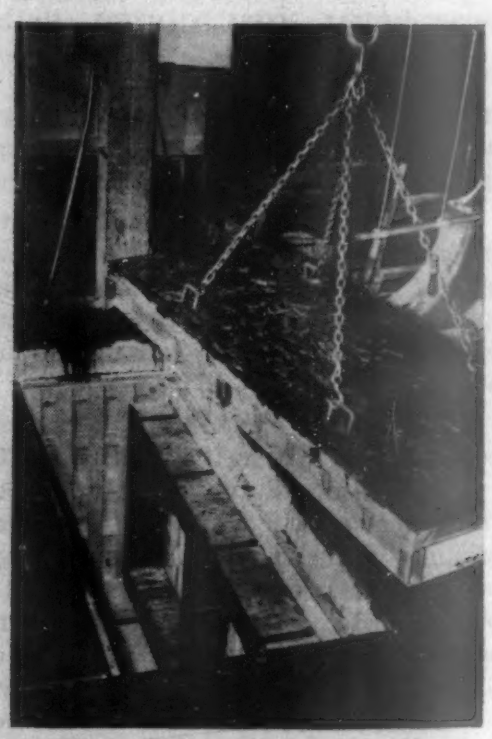
Dies are carried by overhead craneway with power-driven hoist to the die storage section. A sliding shelf is pulled out, the die is deposited on the shelf, which is then pushed back into position.

Formerly workers removed dies from machines and placed them on hand trucks. The trucks were pushed to the storage section and the dies slid off onto the storage rack. This was an awkward, time-consuming, and dangerous job.

The new method saves time, practically eliminates danger, minimizes effort, and reduces fatigue.

A MERRY-GO-ROUND-RACK is used at Day-Brite Lighting, Inc., St. Louis, to store conveyor hangers when they are not in use. The rack is mounted on casters so that it can be moved directly to the conveyor "hang point"; it can be turned clear around, which permits selection from any bin; and it saves a lot of walking and effort

NO CRAWLING under conveyors, or trying to lift heavy sections, in the shipping department of Cosmetic Laboratories, Detroit. A counterweight was placed at the hinged section of roller conveyor, and handles on the coupler end. A girl now can raise the section easily. A "box catcher" on spring release holds cases on the conveyor while the section is raised



Floor Pits Save Space in Pressroom

Storage pits located in the floor of the pressroom at American Seating Company, Grand Rapids, Mich., save valuable floor space.

Because of expanding production

requirements additional space was critically needed in the pressroom. Both ring risers and bolster plates were formerly kept in a special storage area that consumed valuable floor space. To utilize this space for production, pits were dug between the presses. These pits now permit storage of both the ring risers and bolster plates near their points of use.

The pits are of concrete construction with wood side liners to prevent damage to the press accessory parts as they are placed in or removed from the pits. Heavy reinforced covers permit trucks to run over the pits and make it possible to locate smaller presses on top. Pits are opened by overhead crane when necessary. The result —floor space saved and transporting distance of accessory part considerably reduced.

Ill Employees Really Know They Are Missed

A. BARD, Personnel Manager, Wilbur-Suchard Chocolate Company, Lititz, Pa.

Employees who are absent from work for more than a few days in this plant because of illness are helped to convalescence and peace of mind by a simple token of a 5-lb. fruit basket.

The fruit basket is attractively wrapped in transparent cellophane and delivered personally by the personnel manager to the patient at home or at the hospital. Cost of this project is assumed solely by the company.

Other personal calls are made in cases of family bereavement or unusual difficulties, in line with the company's policy of keeping in close touch with the needs of its workers.

Ingots Are Palletized Without Pallets . . .

. . . at the aluminum plant of Federated Metals Division, American Smelting & Refining Company, Perth Amboy, N. J.

Formerly, aluminum ingots were stacked on steel pallets and stored for shipment to fabricators. Freight costs for steel pallets were high. Control of pallets was difficult. Storage space was required for spare pallets. Pallet investment was high.

Now, nested ingots are bundled in unit loads with steel straps. Two special ingots serve as skids for the load. A mold constructed for the special ingots leaves a channel in their bottoms to accommodate the steel strap. Truck forks fit between the skid ingots.

Fabricators, upon receipt of ingots, simply remove the steel straps and melt down the whole load. There are no pallets to buy, store, pay freight on, or to return to the shipper.

Rest Periods Save Production Time

A 10-min. rest period in the morning and afternoon really saves time, is the belief of North American Philips Company, Dobbs Ferry, N. Y. Not only does it eliminate the uncounted and uncontrolled trips to candy vending machines, it also does away with the time lost in eating candy and peanuts on the job.

During their rest periods North American Philips workers are allowed to go to the cafeteria for a mid-shift pick-up. They enjoy especially the home-made pastries and cakes which the company cooks take pride in providing.

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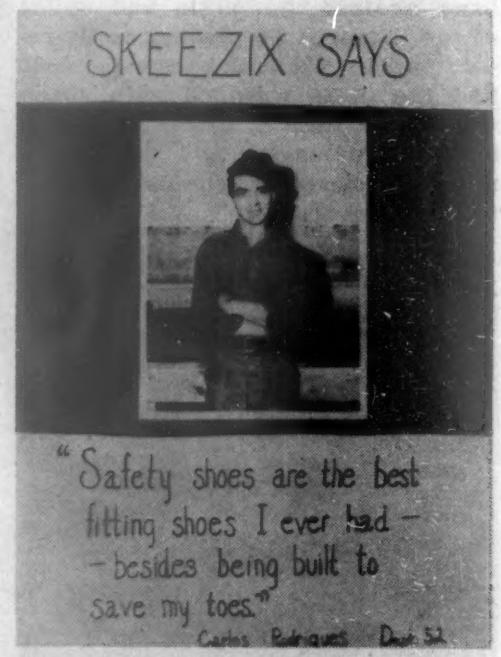

Encouraging Workers to Buy Safety Shoes

Employees themselves help sell safety shoes at Lamson Corporation, Syracuse. Posters showing

photographs of workers and their comments about the shoes bring the message home to fellow-employees.

Realizing that the biggest objection to the shoes in the past had been discomfort because of improper fitting, the Lamson safety committee made arrangements with a local podiatrist. An authorization slip is obtained from the first aid department and presented to the doctor. He examines the feet, fits and sells the shoes. The company pays $2 toward the cost of the shoes, and the balance can be taken out of the worker's check on a regular payroll deduction plan.

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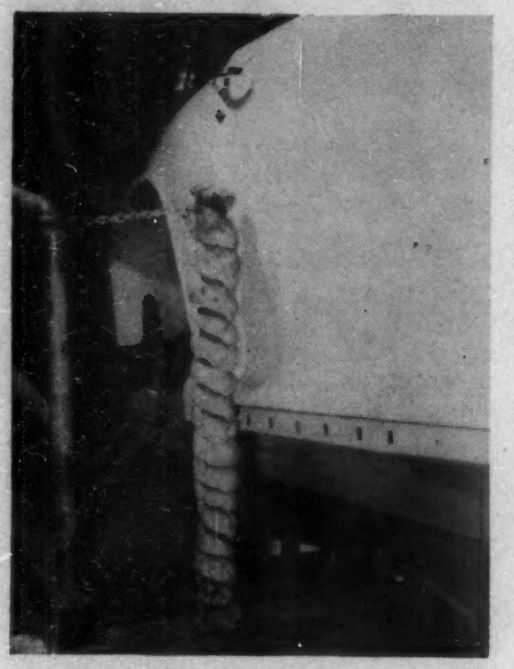

CAR BODIES, assembled at the Fisher Body Division, travel to assembly at the Chevrolet Motor Division, Flint, Mich., on a steeply inclined conveyor. At the top of the incline there are two posts. Sometimes car doors would swing open, bang against the posts, and suffer severe damage. To prevent costly repair work, Chevrolet management had the posts wrapped with sheep wool. Now, even if a door does open it is not damaged, and it is automatically closed by rubbing against the wool-covered posts

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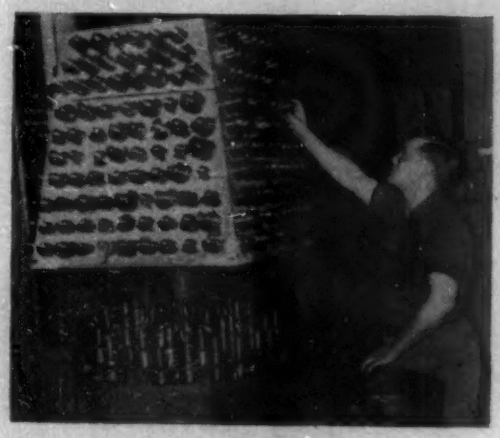

Revolving Rack for Screw Machine Tools

A revolving rack is saving real time in the machine screw department at Snap-On Tools Corporation, Kenosha, Wis. Made of wood, with pegs for parts and circular forming tools, it also saves floor space, and reduces damage to the parts. Tools and parts are arranged in numerical order, so that they can be found easily and with the least possible delay.

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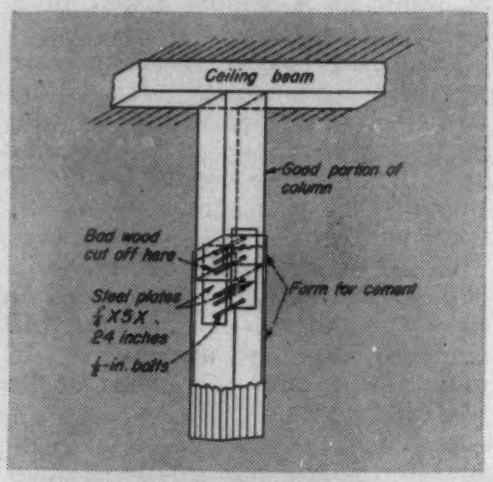

Concrete Bases for Old Wooden Columns

HENRY HARWOOD, Atlanta, Ga.

During an extensive modernization program in a large textile mill, the architect found that the lower third of many of the old 8x8-in. wooden columns between the basement and the first floor were rotted, and otherwise weakened. The upper portions of the columns were good. There were about 50 of these columns, all roughly in the same condition, and replacing them would have run into considerable money. Therefore it was decided to salvage them, which was done as follows:

The bad wood at the bottom was cut off a few scattered columns at a time. The upper portion was held in place with temporary jacks and braces.

A form for concrete was built around each column from which the bad wood had been removed, and a bracing plate of ¼-in. steel was placed inside the form on two opposite sides, as the illustration shows. These plates were 5 inches wide and 24 inches long. Six holes were drilled in each plate and ½-in. bolts about 9 inches long were inserted in the three lower holes of each pair of plates.

When put in place in the form, half of each plate extended over the remaining part of the wooden column, while the lower half of the plate went down into the space in which the concrete was to be poured.

The upper half of each plate was then bolted to the wooden column. Concrete was poured into the forms. When they were removed, each column had a strong concrete base firmly attached to the good wood above.

This method of repair has proved to be satisfactory. By cutting off all columns at the same height from the floor, the strengthened bases are uniform and not unattractive in appearance.

COOLING STORAGE BATTERIES on charge enables Reynolds Alloy Company, Listerhill, Ala., to accelerate the process and keep industrial trucks in operation for three shifts with only two batteries per truck. Batteries are placed over well-water spray pipes installed in a concrete charging pit. Rack takes 54 batteries at one time

LOOKING AHEAD IN LABOR

Last-minute round-up as we go to press

WE'RE getting a shakedown of the many state labor laws passed since the war. The courts have not looked too favorably on some. Nor have the voters in some states. The Supreme Court will speak soon. Here's the picture:

Anti-closed shop constitutional amendments in Nebraska and Arizona and a law in North Carolina are before the Supreme Court. The lower courts approved them.

Despite Republican sweep, Maine voters rejected two laws which would ban the closed shop, secondary boycotts, and sympathy strikes. Earlier, North Dakota citizens okayed similar laws. In Louisiana, the Long machine killed one regulating union activity.

Three other states will vote on closed shop proposals next month: Arizona, Massachusetts, New Mexico.

In New Jersey a lower court validated the anti-utility strike law. But in Michigan two courts say the Bonine-Tripp law is illegal.

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There'll be only one big change in top union bosses this year. Harvey Brown is 65, must retire as head of the big independent machinists' union. Likely successor: Albert J. Hayes, a vice-president, touted as "more aggressive and more liberal" than Brown.

Other old-time union leaders are of retirement age, but will stick through the fight on Congress and the Taft-Hartley law, and a little longer. Green, Murray, Lewis, Tobin, and Hutcheson, for example.

New leaders coming up may take over during the expected Republican administration. Dave Beck, backing Dewey and Warren, already runs the teamsters. Reuther looks like Murray's replacement, but not soon. George Harrison is rising in the AFL.

Union negotiators seeking health or pension plans have new BLS statistics for you: More than 3 million workers now get some kind of welfare benefit under a union contract.

This is a big jump from previous figures: 1,250,000 in 1947, only 600,000 when war ended in 1945. Those totals did not include pensions, however.

But the trend is clear: More workers are getting pensions and sickness, accident, and death benefits. And more employers are bearing the full cost. Where the worker contributes, he's kicking in less.

BLS finds, also, that 11 per cent of the 3 million covered get only pensions. And 45 per cent get other benefits without pensions. The rest, 44 per cent, get both benefits and pensions.

Union membership still rises under the Taft-Hartley law. It's now 15,600,000, or 600,000 more than a year ago. BLS makes this estimate in a new directory of 197 national and international unions.

BLS says one worker in four carries a union card. Six unions have over 500,000 members. There are 37 with more than 100,000.

BLS doesn't tell about union treasuries. We know of seven unions worth $10 million—teamsters', miners', bricklayers', carpenters', machinists' (IAM), electricians' (IBEW), laborers' (Hod Carriers).

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What fate the Hoover commission hands the Labor Department will depend a lot on the views of George Taylor. He's the former War Labor Board chairman who conceived the Little Steel formula.

Hoover's organization is not making a study of the Labor Department, but various reports will touch on government labor functions. Dr. Taylor has been drafted to analyze the various views expressed on labor, and add his own.

We look for Dr. Taylor to urge building up the run-down Labor Department. Some union sources predict it will be abolished. Such fears are unfounded.

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Peace is wonderful—if you can get it.

Each month, for the next 14 months, you'll be hearing how some boss gets along with the union. The true stories—"The Causes of Industrial Peace Under Collective Bargaining"—will come from the National Planning Association.

The first told of 14 strikeless years in the Pacific paper industry. Coming soon: "Confessions" in steel, chemicals, aircraft, glass, men's clothing, food, textiles.

NPA warns of two threats to paper industry peace: (1) Taft-Hartley boon to craft unions; (2) any change in T-H law to ban industry-wide bargaining.

Senate-House watchdog committee will recommend T-H law changes March 1 instead of January 1. Don't look for any major changes. Union shop polls may be dropped. Hartley thinks employers should sign non-Communist affidavits. Neither the committee nor Congress will agree with him.

LOOKING AHEAD IN BUSINESS

Last-minute round-up as we go to press

WHAT will record harvests do to food prices—and to next spring's wage negotiations?

Farmers are winding up an all-time record grain harvest this month. They are hauling more corn, wheat, and other basic crops to market than ever before. As a result, wholesale prices of almost all farm products—*except livestock and dairy products*—are at or close to the point where the government steps in to stabilize them by making loans to farmers.

But on that one exception—livestock and dairy products—hangs a major part of the outlook for food in the cost of living.

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Here's how it works: If *all* farm prices were to fall to the price support level, farm prices at wholesale would come down 20 to 25 per cent. And much of that reduction would be passed on to the housewife as a saving in her food budget.

But meat at wholesale has been selling at better than 60 per cent above the support levels. And dairy products are also well above the floor. Together, the two make up 60 per cent of the family food budget. ***Meat is the largest single item. Prices of other foods may come down somewhat, but they don't swing as much weight in the food budget.***

That means the impact of bumper crops on supermarket prices will be fairly small in the next few months.

So the question is: ***What will happen to food prices next year?***

One thing is certain: This fall's bumper crops will end the fast climb that food prices have seen since the end of the war. Now at a peak, they will probably ease through the rest of 1948, and decline slowly in '49. How much depends a great deal on the housewife. She has been spending a larger part of the family income for food than ever before—a larger part (almost one third of the family's income after taxes) than economists thought possible. That eagerness to buy holds prices high.

Best estimates on the price question are that retail food prices may drop 5 to 6 per cent next spring, and more when next year's crops start to come in.

Meantime, prices on other items in the cost of living index are rising. Things like house furnishings, rent, fuel, electricity, and ice are creeping upward. They are likely to continue to go upward, offsetting partially anything that housewives may save on food and making any downward trend slow and gradual.

All in all, this means that the cost of living is likely to stabilize near today's level through the rest of 1948. Early 1949 should see it turn down.

Taking business's pulse as the fourth quarter opens, economists see 1948 as the biggest peacetime year yet for the manufacturing industries. Employment, sales, and profits are headed for new records.

Employment in non-farm jobs hit a new all-time peak in August—52.7 million workers. And, looking ahead, personnel men and the Census Bureau see local labor shortages, much like the wartime shortages, developing this fall.

Production, as measured by the *Business Week* index in September was running about 4 per cent above a year ago. Steelmakers were turning out industry's most basic raw material at an annual rate of almost exactly 90 million tons, indicating an annual production this year of 87 million tons, as compared to 85 million last year.

Profits for 1948 will certainly be up from '47, may hit a record-smashing $20 billion after taxes. That's up some $2.5 billion from last year, but first-half earnings report make the estimate look sound. In the first six months earnings of leading corporations, as tabulated by the National City Bank of New York, were up 19 per cent above the first half of 1947, and 7 per cent above the second half.

One thing to remember about profits: They are counted on as never before to finance new buildings and new equipment. The slow-moving securities markets are providing only about one-fifth of the almost $20 billion business is putting into new buildings and new tools this year.

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Despite the record-smashing boom, business shows an uneasy lack of confidence. But with something more that 61 million people at work, the steel, auto, and construction industries going full-tilt, and government propping up major segments of the economy, depression seems a long way off. Supports under farm prices prevent an agricultural collapse.

Government agencies altogether spend about one dollar out of five of the national income, and so support over-all demand. In bank deposit insurance, mortgages, unemployment compensation, the Marshall Plan, military expenditures, and other ways—the government puts dozens of props under business.

So—unless we have a war with Russia, or some other unlooked for catastrophe—the U.S.'s chances of warding off widespread depression are good.

USERS EXPRESS PREFERENCE FOR Exide IRONCLAD BATTERIES

Electric industrial truck users have frequently expressed a preference for Exide-Ironclad Batteries . . . the batteries that assure peak performance day after day.

Such overwhelming preference for the Exide-Ironclad Battery is based upon user experience. This unique battery has, during the past 35 years, proved itself to be a thoroughly dependable, safe and efficient power source for all makes and types of electric industrial trucks.

Different from all other batteries in construction as well as in performance, the Exide-Ironclad possesses ALL FOUR of the essential characteristics demanded of a battery for electric industrial truck service—(1) high power ability, (2) high efficiency, (3) great ruggedness, and (4) long life. These characteristics are due to the special construction of the Exide-Ironclad Battery, especially its rugged, tubular positive plate.

Write for further particulars and FREE copy of Exide-Ironclad Topics, which covers latest developments in material handling and shows actual case histories.

1888...Dependable Batteries for 60 Years...1948

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia 32 • Exide Batteries of Canada, Limited, Toronto

maintenance data sheet 153

SAFE STRUCTURAL LOADS

concentrated at mid-spans of laterally unsupported members

THE CURVES ON THESE DATA SHEETS are particularly useful to plant engineers in the design and erection of simple hoists, platforms, and catwalks. They were developed to provide a quick way of determining the sizes of most-used steel I beams, channels, and angles needed to support any single concentrated load at mid-span. They should not be used in building design or floor loading calculations where other than single concentrated loads are involved.

In all uses, care must be exercised to take into account other possible loads carried by a member under consideration. Also, the compression stress in the webs of the members at end bearing surfaces must not exceed 24,000 p.s.i. Where this value is exceeded, the webs should be reinforced or the length of the bearing surface increased. To check the web compression stresss, it may be safely approximated by dividing one-half the concentrated load at mid-span by the web bearing area in square inches. This area is obtained by multiplying the thickness of web (in inches) by the length of bearing (in inches).

Here are typical applications:

1. In hoist or monorail layouts, the curves will show the size of member required for a given span and load. An allowance of 25 per cent should be made to take care of impact.

2. When the load and size and span of member is known, the curves afford a check on safety of the installation by showing if an overload exists.

3. In moving and erecting equipment, temporary hoists usually must be erected or attached in many unanticipated locations. These curves can be used as a guide to ascertain the safe load limits.

4. For an evenly distributed load over the entire span, the allowable load is known to be double that shown for a concentrated load at mid-span.

Basis for the derivation of these curves is the formula:-

$$M = \frac{4FS}{L} - \frac{WL}{12}$$

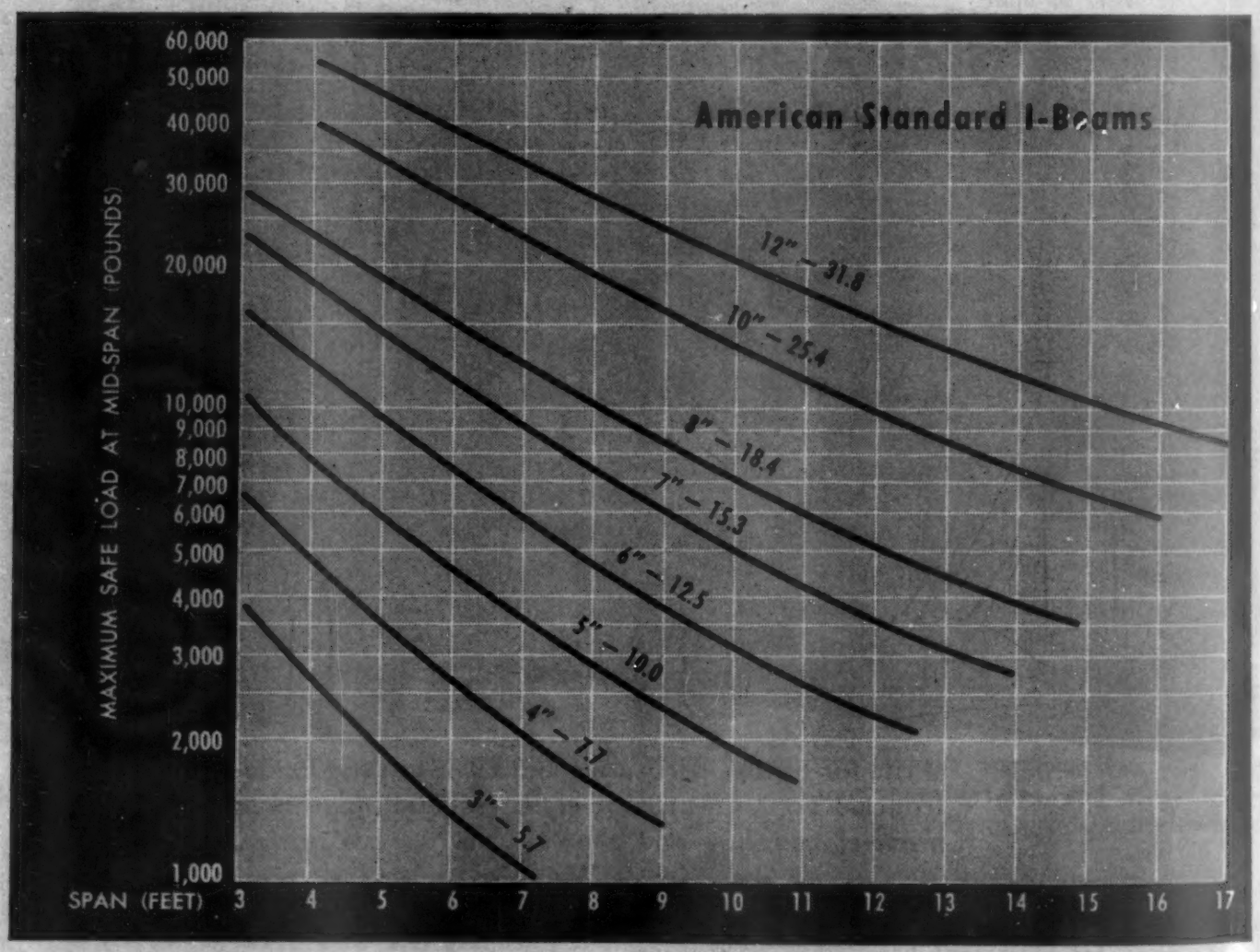
where

$$F = \frac{22500}{1 + \frac{L^2}{1800\ B^2}}$$

S = section modulus, inches³
L = span, in inches
B = width of flange, in inches
W = weight of member, in pounds per foot
M = maximum safe load, in pounds

Note: Value of *M* taken from handbook of Carnegie Steel Company. Value of *F* taken from handbook of American Institute of Steel Construction.

CONTINUED ON PAGE 134



Prepared by Plant Engineering Department, Canadian General Electric Company, Ltd., Peterborough, Ontario, Canada

$300 SAVED IN "PIN" MONEY

Sun Lubricant Reduces Toggle Pin Wear 70% and Minimizes Shutdowns in Die-Casting Plant

In injection-molding zinc die castings, a manufacturer was experiencing excessive wear and breakage in toggle pins. The lubricant in use, which was applied to the pins by gun, just couldn't stand up under heavy-duty operation.

Asked for his advice, a Sun engineer recommended a grease which had been "Job Proved" in many machines of the same type. Over a period of 14 months, use of this Sun grease resulted in 70 percent reduction in breakage of pins. Translated into hard cash, this represented a $300 saving. In addition, costly shutdowns for pin replacement were greatly reduced.

Records like this are not unusual in plants where Sun "Job Proved" greases and oils are used. You can rely on these lubricants to help keep equipment operating steadily and safely, with minimum time-out for maintenance. For the booklet "What Makes a Good Grease," write Dept. FM-10.

SUN OIL COMPANY • *Philadelphia 3, Pa.*

In Canada: Sun Oil Company, Ltd.
Toronto and Montreal

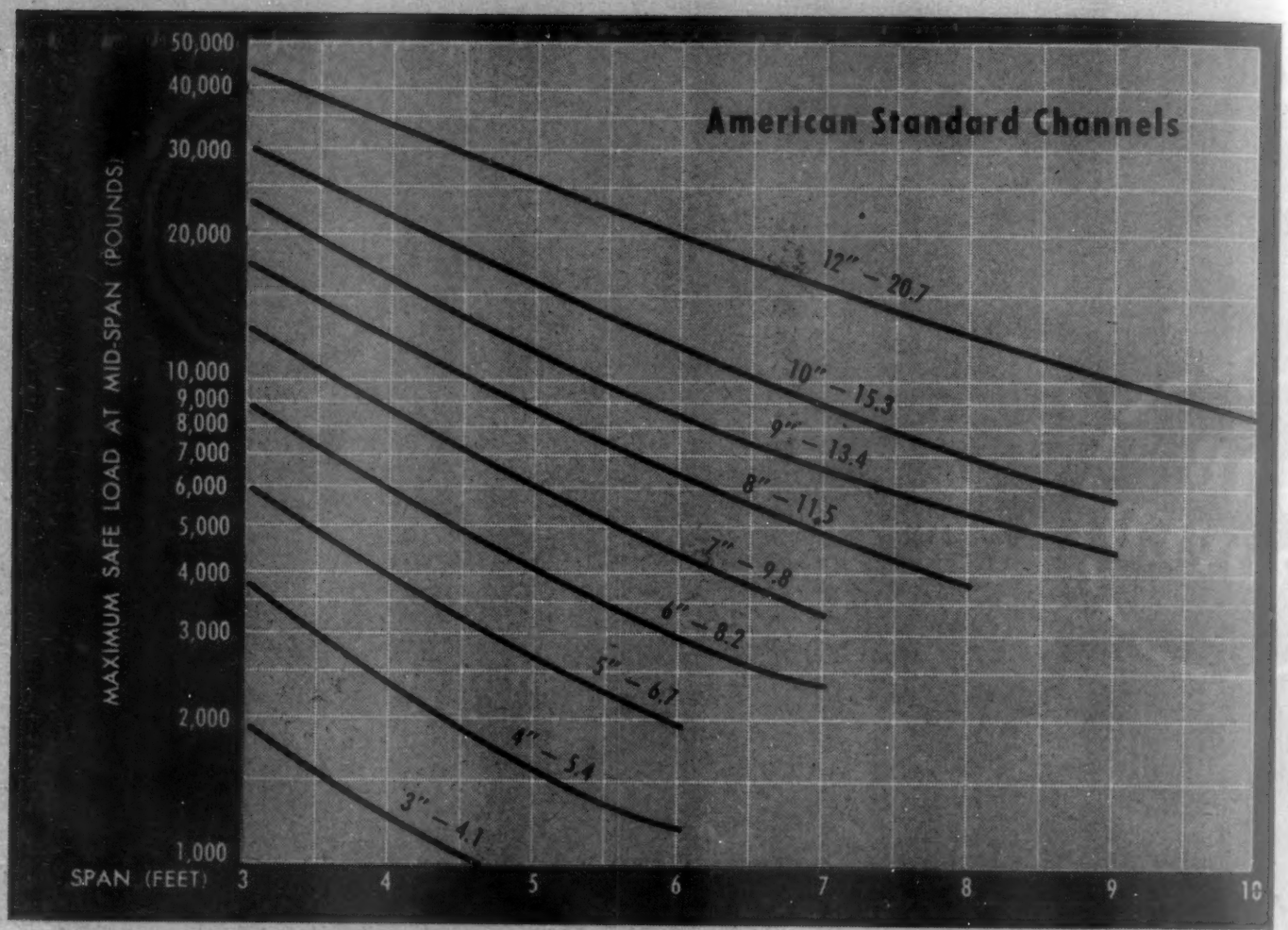
SUN PETROLEUM PRODUCTS SUNOCO

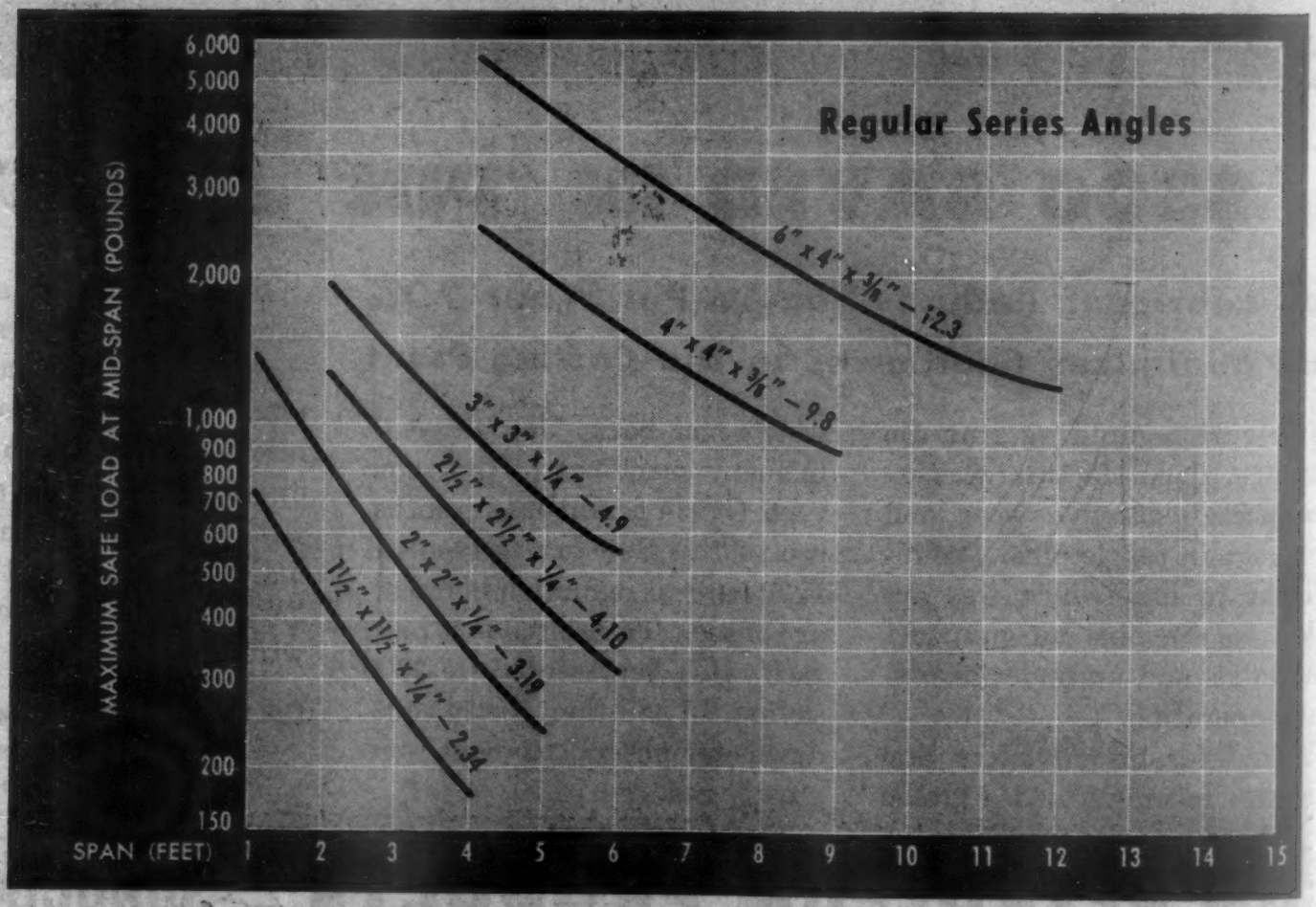
"JOB PROVED" IN INDUSTRY

maintenance data sheet 154

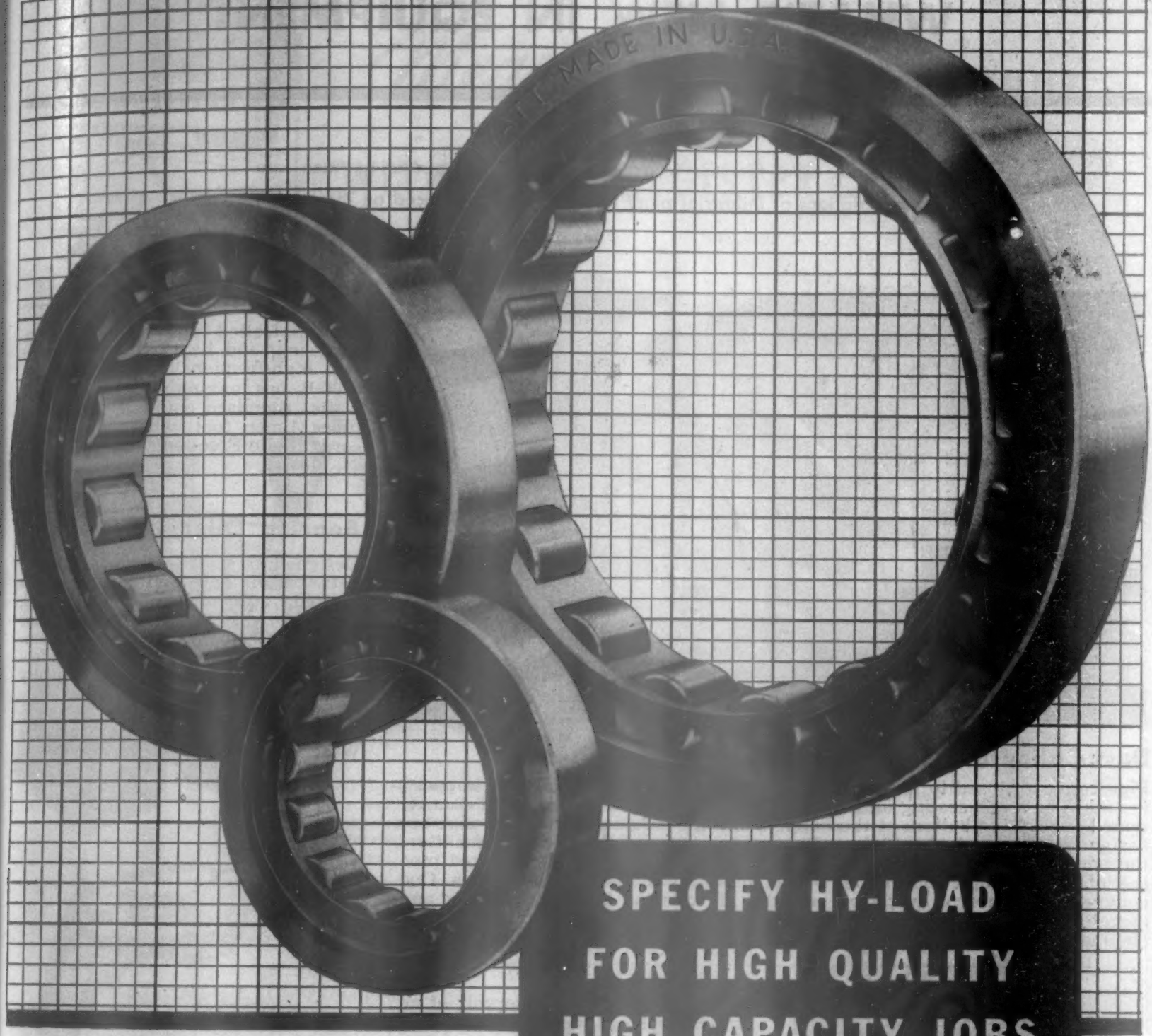
SAFE STRUCTURAL LOADS

CONTINUED FROM PAGE 132





Prepared by Plant Engineering Department, Canadian General Electric Company, Ltd., Peterborough, Ontario, Canada



SPECIFY HY-LOAD FOR HIGH QUALITY HIGH CAPACITY JOBS

HY-LOAD is an outstanding member of the Hyatt Roller Bearing family. Takes on tough loads without a murmur—rough service doesn't bother it a bit.

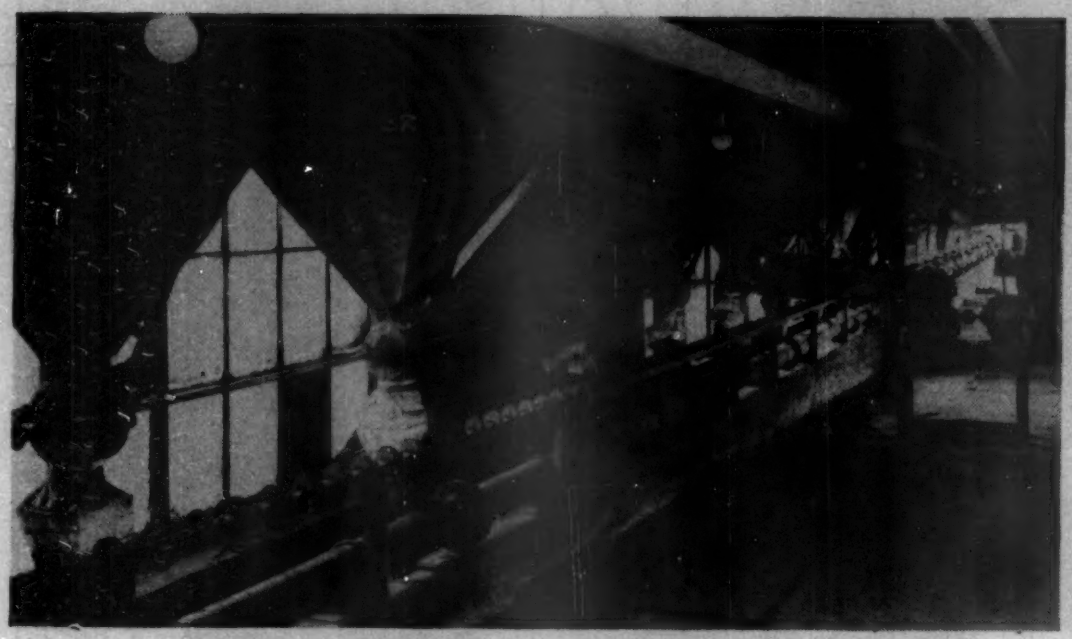
Universally useful because HY-LOAD is made in ten types and a wide range of sizes. A high quality roller bearing for high capacity work. Separate parts are completely interchangeable; adhering to AFBMA dimensions.

HY-LOADS, for years, have demonstrated their quality and trouble-free performance in many fields—mills and factories—on farms—oil fields—railways—highways and skyways. May we help you? Hyatt Bearings Division, General Motors Corporation, Harrison, New Jersey.

HYATT ROLLER BEARINGS

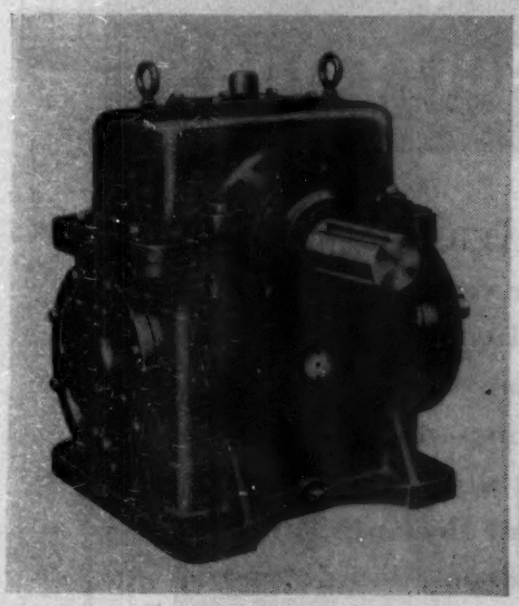
WHAT'S NEW IN EQUIPMENT

Briefed here—for the convenience of plant operating men—are descriptions of industrial plant equipment newly placed on the market



Dust Collector Conveyors

Pipe conveyor, used to remove accumulated dry dust from collector hoppers, is said to be a self-sealing unit, with no dust hopper gates. Dust-tight connections between the bottom of the hoppers and the carrying run of the pipe are designed to prevent loss of dust. Rubber flighted sealed pin chains facilitate the handling of abrasive dust, and all round rubber flights in restricted pipe sections permit operation under varied pressure or vacuum conditions. One convyeor can receive dust from a series of collector bins, and convey and elevate it any reasonable height or distance, according to the manufacturer. Hapman Conveyors, Inc., 2405 West McNichols, Detroit 21, Mich.



Worm Gear Drives

Carbon lapped ring-type seal prevents leakage of oil on enclosed worm gear drives, according to manufacturer. Available in horizontal and vertical types, single and double worm gear reductions, a wide range of standard ratios. Thermal capacity of these units, called Hypower, is said to be increased by the immersion in the oil reservoir of an air channel cylinder through which passes a high-velocity stream of cool air. Foote Bros. Gear & Machine Corp., 5304 South Western Blvd., Chicago 9.

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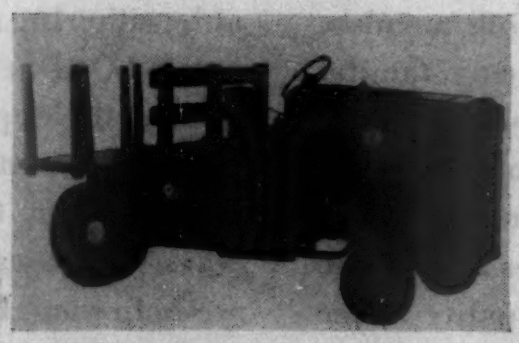


Stake Platform Tractor

Designed to carry up to 4000 pounds of heavy bulky material, Model J233PLS Shop Mule has a stake platform 64 inches wide and 51 inches long behind the driver's seat. Uses heavy-duty International Harvester 6-cylinder motor, and has a towing capacity of 60 tons on dry level concrete. W. F. Hebard & Co., 336 West 37th St., Chicago 9.

High-Frequency Heater

For controlled and rapid brazing, soldering, and heat-treating of metals, high-frequency heater, Model 3000-B, has maximum output of 3000 watts. Standard equipment includes tubes, timer, foot switch, and power cord. Radio Frequency Corp., Boston 34, Mass.

•

Bearing Oiler

Designed for installation where space between oil hole and machinery is limited, automatic oiler for solid, wick, or waste-packed bearings has an off-center feed spout. When temperature rises, oiler discharges a few drops at a time; stops automatically as bearing cools. Unbreakable plastic reservoir available in 1-, 2-, and 4-oz. sizes. Trico Fuse Mfg. Co., 2051 West Wisconsin Ave., Milwaukee 3.

•

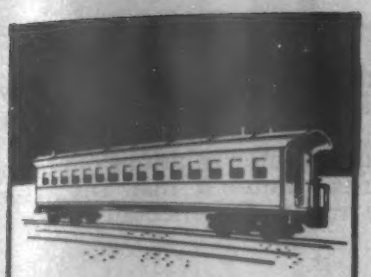
Electric Drills

Line of eight portable electric drills is equipped with "K-O" keyless drill chucks. Sizes range from a ¼-in. lightweight unit to a heavy-duty ⅞-in. drill. K. O. Lee Co., Aberdeen, S. Dak.

•

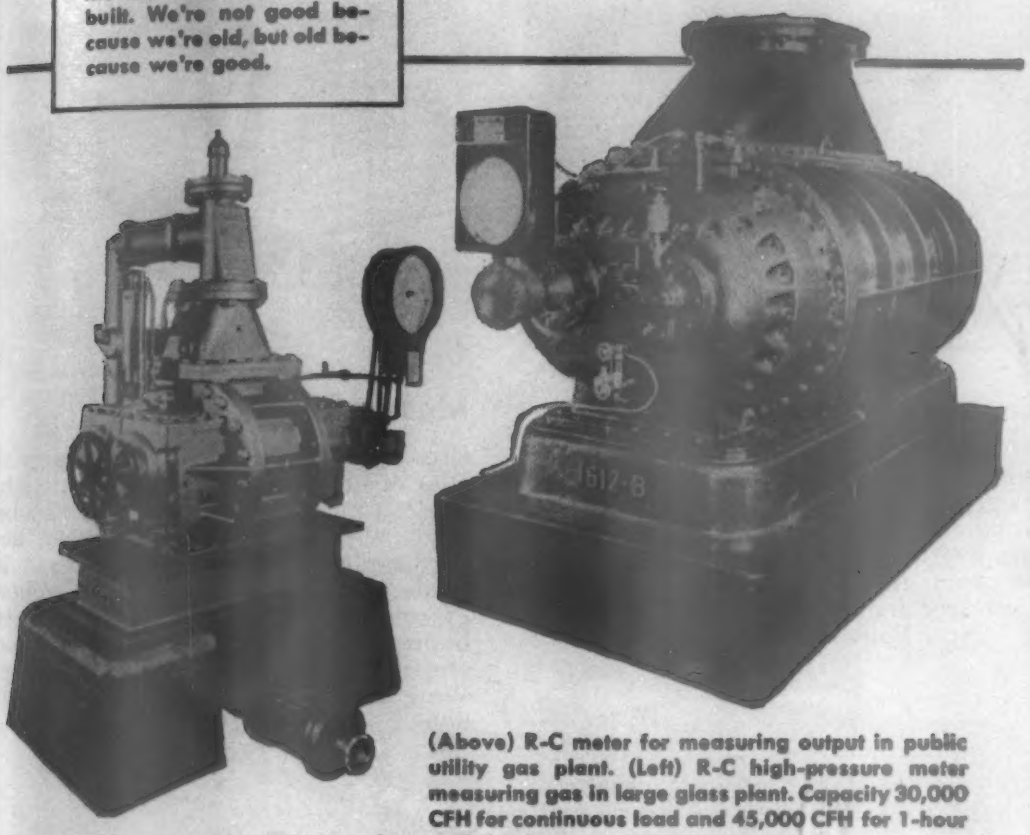
Sealing Compounds

Two thermal barrier sealing compounds, known as Stavond FR8 and FR10, are said to withstand temperatures as high as 2800 deg. F. Suitable for use as insulation for electrical junction boxes, heat exchanger couplings, and for lagging steam pipes and hot air ducts where resistance to vibration and heat is required. May also be used as abrasion resisting coatings for electrical systems. May be applied by trowel, brush, or extrusion gun. FR8 is said to withstand temperatures up



George M. Pullman's first sleeping car went into service in 1859, five years after the first Roots Blower was built. We're not good because we're old, but old because we're good.

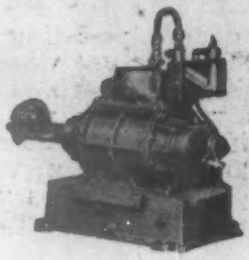
Measure INPUT OR OUTPUT WITH CASH REGISTER *Accuracy*



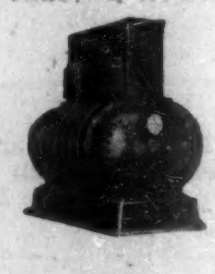
(Above) R-C meter for measuring output in public utility gas plant. (Left) R-C high-pressure meter measuring gas in large glass plant. Capacity 30,000 CFH for continuous load and 45,000 CFH for 1-hour peak load.

WIDE VARIETY OF R-C METERS FOR INDUSTRIAL USES

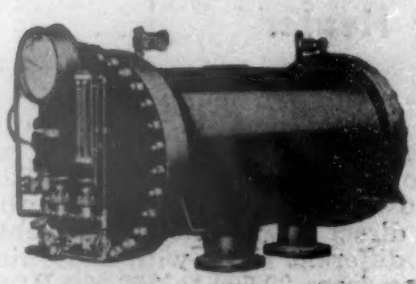
R-C Meters are available in 31 standard sizes, for maximum working pressures of 25 lbs., 50 lbs. and 125 lbs., and for capacities from 4,000 to 1,000,000 C F H. Meters for higher pressures or other unusual requirements can be adapted from standard units or built to the user's needs.



(Left) This 2½" x 7" meter has an inclined differential gauge, with top inlet, and outlet in bedplate.



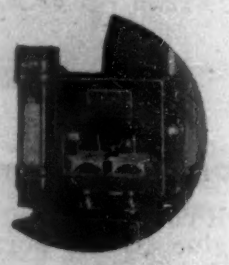
(Right) Large size low-pressure meter, with side inlet box, bottom outlet and P.V.T.T. Recorder.



(Above) Special high-pressure meter, for line pressures of 300 lbs. and up.

ACCESSORIES FOR R-C METERS

Many types of recorders and integrators are available for R-C Meters. They enable users to compile records for practically every phase of metering operations, for almost any unit of time.



R-C Meter equipped with pressure and temperature integrator which corrects for both pressure and temperature.

Wherever gas needs to be measured . . . for buying, selling or processing . . . you get unfailing accuracy from R-C Positive Displacement Meters. The reasons are:

1. Accuracy is not affected by variations in specific gravity, rate of flow, pulsation, moisture or impurities.
2. Accuracy does not depend on uncontrollable factors.
3. Accuracy is not subject to adjustment of meter or recorder by operators.
4. Accuracy is not affected by reasonable overloads.
5. Accuracy is permanent because measuring chambers are surrounded by precision-machined, cast-iron surfaces.

The wide use of R-C Meters by public utilities, producers, industrial users and processors is the best evidence of satisfactory performance. For details, ask for Bulletin 40-B-14 or write us about your specific problem.

ROOTS-CONNERSVILLE BLOWER CORPORATION
810 Central Avenue, Connersville, Indiana

ROOTS-CONNERSVILLE
ROTARY CENTRIFUGAL
BLOWER BUILDERS R-C SINCE 1854
BLOWERS · EXHAUSTERS · BOOSTERS · LIQUID AND VACUUM PUMPS · METERS · INERT GAS GENERATORS

★ ★ ONE OF THE DRESSER INDUSTRIES ★ ★

Pipe-Fitting Covers

Pre-formed, factory-made, pipe-fitting covers of Foamglas, for both hot and cold fittings, are suitable for use wherever exact temperature control is required, whether heat is to be retained or excluded. Manufactured in all sizes for L's, T's, unions, valves, elbows, and flange covers. Made of glass, they retain their original insulating efficiency, according to the manufacturer, are not affected by humidity, are waterproof, vaporproof, fire retardant, and resistant to fumes, acids, and other elements which frequently have a deteriorating effect on insulation. Pittsburgh Corning Corp., Port Allegheny Plant, Port Allegheny, Pa.

to 2000 deg. F., and FR10, 2800 degrees. American Latex Products Corp., 921 Venice Blvd., Los Angeles 15.

•

Unit Heater

One-piece construction of top, bottom, and sides of unit heater, Model H, is said to protect "floating" coil against rapid temperature change expansions and contractions. Fan shroud and grills or louvers on the front direct flow of heat. Available in 24 different sizes, with capacities ranging from 20,000 to 352,000 B.t.u. The Trane Co., La Crosse, Wis.

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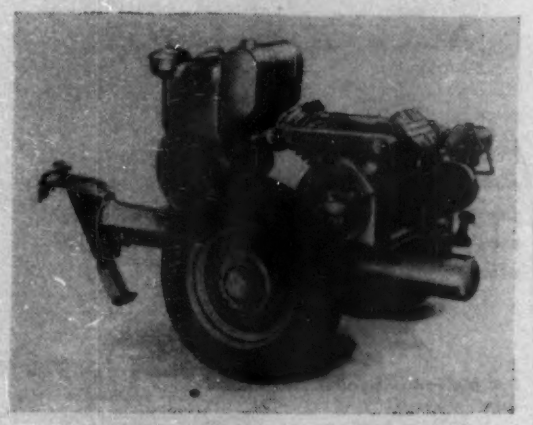

Portable Compressor

Self-contained, air-cooled, gasoline-engine-driven portable compressor, called Pac-Air, has a piston displacement of 37.5 c.f.m. at 80 p.s.i. pressure. Equipped with an automatic unloader which permits constant speed operation, but compresses air only when needed. Unit and engine are mounted on air receiver which forms an integral part of the running gear. Pneumatic tires and ball-and-socket type trailer hitch permit towing. Ingersoll-Rand Co., Phillipsburg, N. J.

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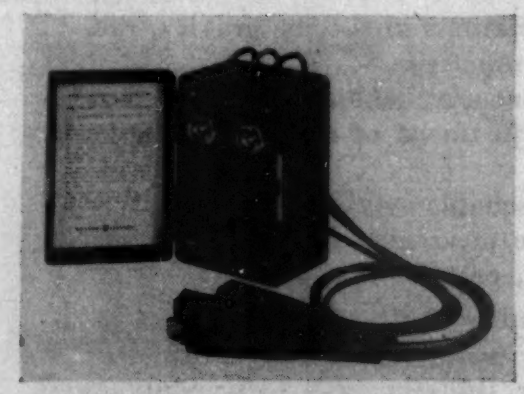

Phase-Sequence Indicator

Entirely static, with no moving parts, bearings, or pivots, phase-sequence indicator is applicable to 240-, or 480-volt circuits at 25, 50, and 60 cycles. Leatherette-covered wooden case protects two Type NE-51 standard neon lamps. Three 30-in. leads have insulated clips. Manufacturer says the indicator can be used to predict the directional rotation of polyphase meters for machine drives, elevators, air conditioning equipment; to determine the proper connections for paralleling generators, transformer banks, and power buses; for watthour meters, reactive-component meters, power-factor and similar meters; phase-sequence relays; to check vacuum-tube, thyratron, rectifier, and inverter installations; and to study vector relations of polyphase circuits. Meter & Inst. Div., General Electric Co., Schenectady 5.

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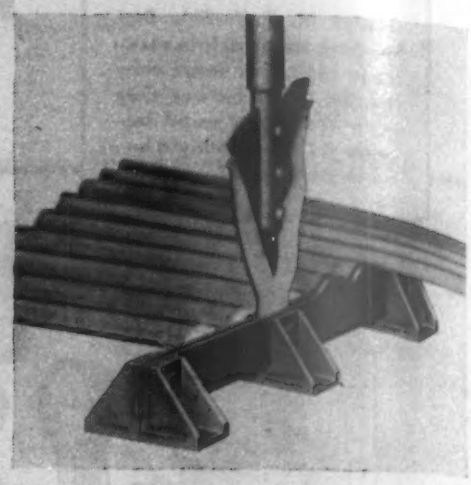

Metal Shear

Crosswise, lengthwise, or diagonal cuts of corrugated metal, metal lath, sheet, or corrugated asbestos can be made with portable metal shear, according to manufacturer. As cut is made, shear removes narrow ribbon of material which allows the sheet being cut to be moved through the shear without binding or twisting. Weighs 15 pounds. Universal Products Co., San Francisco.

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Masonry Drills

For use with electric rotary or breast drills, carbide tipped masonry drills are suitable for use on concrete, brick, stone, and other hard materials. Available in sizes ranging from 11/64- to 1½-in. diameter. Holub Industries, Inc., Sycamore, Ill.

•

Stabilizer

High frequency stabilizer is suitable for use with either a.c. or d.c. welders in inert-gas-shielded tungsten electrode welding; in sheet metal work and other applications involving low currents; in vertical and overhead welding; and with the twin carbon arc torch. Developed to adapt ordi-

The New Snap-on Catalog of Mechanics' Tools now ready for distribution

Send for your copy today!

It's new! It's factual! It shows the complete line of Snap-on mechanics' tools in sets and as individual pieces! It gives you sizes, construction and special features! It illustrates and describes many reasons why Snap-on tools are the choice of better mechanics everywhere!

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SNAP-ON TOOLS CORPORATION

8044-J 28TH AVENUE • KENOSHA, WISCONSIN

International Division: Kenosha, Wisconsin, U. S. A.

nary a.c. transformer welders for "heliarc" welding, this unit is said to increase the impulses from 120 to 4,000,000 impulses per second. An intensity control is provided to adjust the frequency to requirements. Available in two sizes with maximum capacities of 300 to 500 amperes, respectively. The Hobart Brothers Co., Hobart Square, Troy, N. Y.

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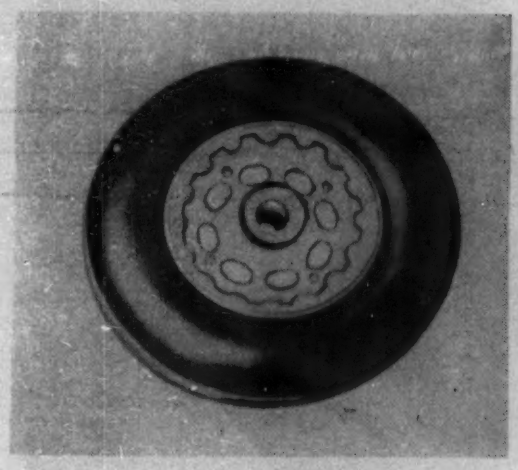

Aluminum Wheels

Line of aluminum wheels features split-type construction. Wheels are available for 6x2.00, 8x2.50, 10x2.50 or 10x2.75, 12x3.00, 16x4.00, and 4.00x8 zero pressure, solid rubber and pneumatic industrial tires. Can be furnished with bearings, machined to special bearing specifications, with or without tires. The Pikes Peak Aluminum Foundry, Inc., Box 401, Colorado Springs, Colo.

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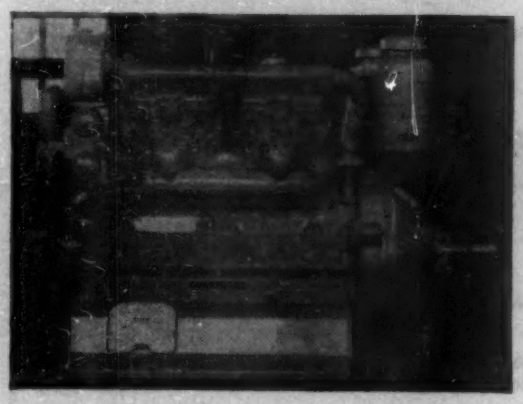

Diesel Engines

Four models of diesel engines, each of which is available as a power unit and electric set, have a bore and stroke of 5¾x8 inches and full load speed range of 800 to 1200 r.p.m. to provide power outputs ranging as high as 500 hp. All have a 60-deg. "V" arrangement; they are 48½ inches wide by 70½ inches high. Two are V8 engines, 88 5/16 inches long. The 12-cylinder D386 is 108 9/16 inches long, and the 12-cylinder D397 is 112½ inches long. Caterpillar Tractor Co., Peoria 8, Ill.

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Air Vents

Phosphor bronze helical bellows with relatively large diameters in line of high pressure air vents for steam equipment are said to permit oversize valve orifices at pressures up to 200 p.s.i. Suitable for installation on steam jacketed kettles, calender beds, canning retorts, rotary driers, and similar equipment. Vents have renewable heads of stainless steel, bodies and bonnets of cast brass, cast iron, or semi-steel, depending upon the size and pressure. Available in vertical and angle patterns, sizes ⅜ to 1¼ inches. Sarco Co., 350 Fifth Ave., New York 1.

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Ballbearing Swivels

Annular ball bearing swivels, developed to eliminate twist and line unlaying of wire hoisting lines, are designed for use in connection with whip lines, hoisting, and loading lines. Because of the reaction from the annular thrust swivel, loads are said to arrive at their destinations in almost the same position as they were in at the start of the move. Design of the swivels makes possible use of the entire bearing surface of three ball races. The bearings, protected from dirt and water by sealed-in heavy grease packing, are assembled under pressure to force all vacuum pockets from the bearing chambers. Swivels are cadmium plated, available in ten different styles. General Machine & Welding Works, 1100 East 2nd St., Pomona, Calif.

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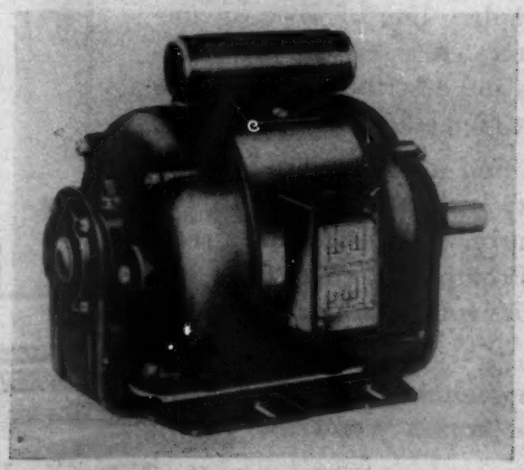

Rubber-Mounted Motors

Heavy-duty rubber-mounted a.c. motors are made in ratings up to ½ horsepower, 1725 and 3450 r.p.m., both single and polyphase, and are furnished with either sleeve or ball bearings. The single phase motors are either capacitor-start or split-phase. Centrifugal switch has large silver contacts; motors are prelubricated and sealed to assure cleanliness. Although rubber mounts are standard, motors can also be furnished with rigid base. Kingston-Conley Div., The Hoover Co., North Plainfield, N. J.

•

Speed Reducer

Gears of differential helical gear speed reducer are combined in a planetary frame. Ratios from 5 to 1 to as much as 50,000 to 1 can be provided with no increase in number of parts, states the manufacturer. Horsepower ranges from 0.62 to 81.5; six sizes are available in horizontal, vertical, and flange-mounted styles. Winfield H. Smith Corp., Springville, N. Y.

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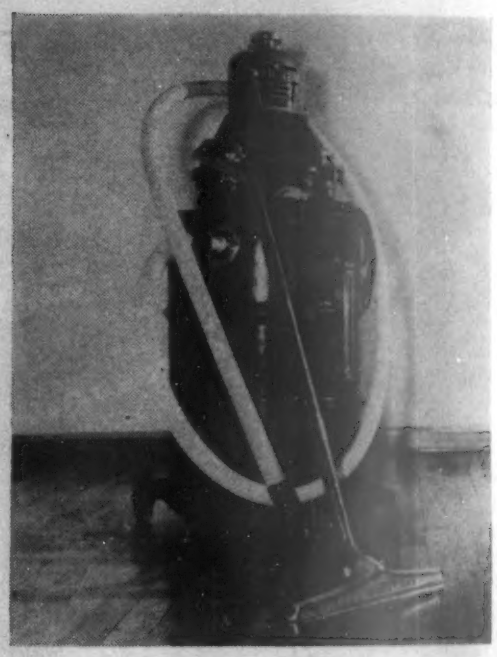


Vacuum Cleaner

Designed for large floor areas, wet-dry vacuum, the MCV-255, has 50-gal. capacity. Glass gage shows content level. Unit is powered by a 1½-hp., 110-volt, 60-cycle universal motor, providing a water lift of 80 inches. Motor is cooled by separate air circulating system, not by exhaust air expelled by vacuum. Mounted on three roller-bearing wheels; front wheel, attached to the tongue, pivots on ball bearings. Multi-Clean Products, Inc., 2277 Ford Pkwy., St. Paul 1, Minn.

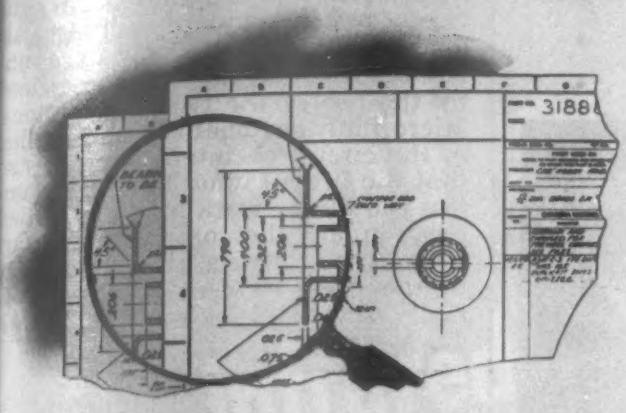
•

Mercury Switches

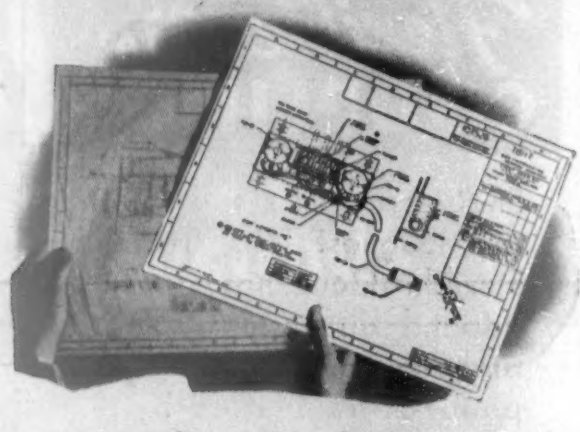
An electric weld seals hydrogen gas under pressure in the metal case of mercury switch. This is said to keep the pressure intact whether the switch is in use or inactive. Having the gas under pressure is said to kill the usual arc between the mercury and contact points of the switch, practically eliminating corrosion of

Because it's photographic... this new

intermediate paper gets more out of every drawing

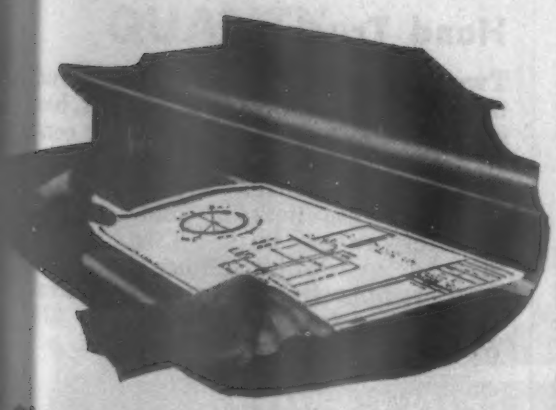


Uses photography's unique ability to step up contrast in reproduction . . . Silver-sensitized, photographic . . . Kodagraph Autopositive Paper has the ability to increase contrast in reproduction—to produce intermediates as good as originals—*and better.* Shop prints, too, are sharp, clear, thanks to the brilliance of these intermediates—to their extra thinness, even translucence.



Assures quality reproduction—even from "tough" originals . . . No question about quality with Kodagraph Autopositive Paper. Weak pencil tracings come through with ink-line density. Also tough "unprintables"—opaque drawings, faded originals, blueprints, direct process prints—originals of every type.

Kodagraph Autopositive Paper



Gives more . . . on present equipment . . . Kodagraph Autopositive Paper is easy to use. Nothing new to buy . . . it prints direct-to-positive . . . in ordinary room light . . . on regular blueprint or direct process equipment or in a vacuum frame. Nothing new to learn . . . simple photographic processing—no darkroom—no negative step. What's more, finished intermediates are tough, long-lasting . . . deletions, drawing-board changes are readily made, redrafting costs kept to a minimum.

EASTMAN KODAK COMPANY
Industrial Photographic Division
Rochester 4, N. Y.

Seeing is believing . . . Ask your reproduction department or local blueprinter for samples of intermediates made on Kodagraph Autopositive Paper—also shop prints made both from these intermediates and from original drawings. You'll see the difference . . . the outstanding advantages of Kodagraph Autopositive Paper.

Mail coupon for FREE booklet

Eastman Kodak Company
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Please send me a copy of The Big New Plus—your booklet about Kodagraph Autopositive Paper and the other papers in this new Kodak line. I have
☐ direct process ☐ blueprint ☐ contact printing equipment.

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Company_____
Street_____
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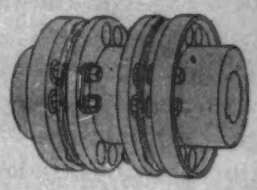
State_____

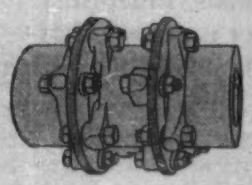
Kodak

THOMAS Flexible ALL METAL COUPLINGS

Engineered to stand up on the toughest jobs, Thomas Flexible Couplings do not depend on springs, gears, rubber or grids to drive. All power is transmitted by direct pull.



The standard line of Thomas Couplings meets practically all requirements. But if unusual conditions exist we are equipped to engineer and build special couplings.



THE THOMAS PRINCIPLE GUARANTEES PERFECT BALANCE UNDER ALL CONDITIONS OF MISALIGNMENT

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WARREN, PENNSYLVANIA

the electrode. Suitable for use in high capacity, highly inductive circuits, or where variable loads place undue strain on ordinary switches. Models range from 1 to 65 amperes in capacity, with or without plastic case, with or without rubber insulation. Durakool, Inc., Elkhart, Ind.

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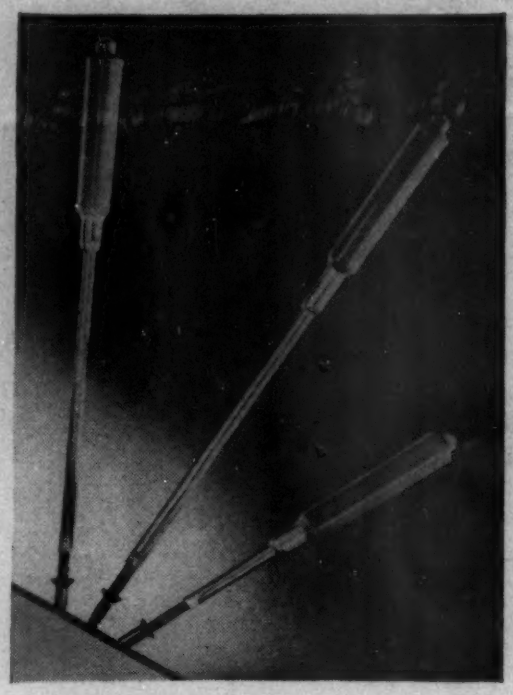

Screw Starter

Pressure on the red plastic handle of the T & G screw starter rotates dual bits within the screw-head slot, locking the screw until it has been well started. Grip increases with added pressure on the handle, is disengaged by pushing a spring-loaded button in the end of the handle. Bits and bit support are cadmium-plated steel. Manufacturer claims that the handle will not shatter or chip if dropped, has high dielectric strength. Made in sizes for light and heavy duty, adaptable to slotted, Phillips, and all special screw heads. 18th Ave. Motor Service, 18th & Franklin Sts., Denver 6, Colo.

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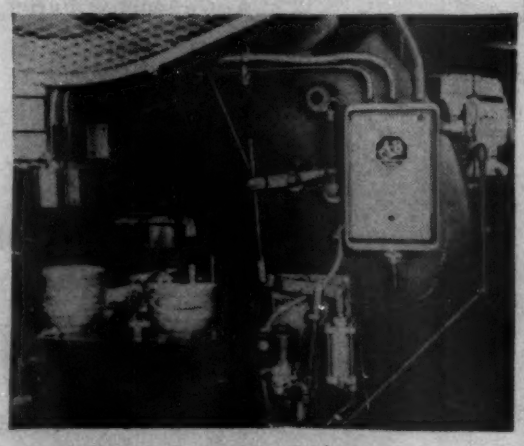

Punch Press Guard

Designed for use on any size of inclinable, direct clutch press requiring no more than 150 pounds pull to operate the foot trip, pushbutton punch press guard is air and electrically operated. The foot treadle is replaced by an air thruster; two pushbuttons, located far enough apart from each other so that operator must use one hand on each, are installed in any convenient location on the press. Only by simultaneously pushing both buttons is the circuit completed and the clutch released to allow the press to function. Foot treadle can be disconnected or removed. An anti-repeat switch, standard equipment, allows ram to descend only once, unless the solenoid valve is re-energized by the use of the two start buttons. Micro-limit switches can be installed in the circuit on interlocking dies so that the press cannot be operated unless the die or work is in the correct position, and then only with the start buttons, eliminating possible damage to the press or dies. Graham Specialty Co., 12925 Auburn Rd., Detroit 23, Mich.

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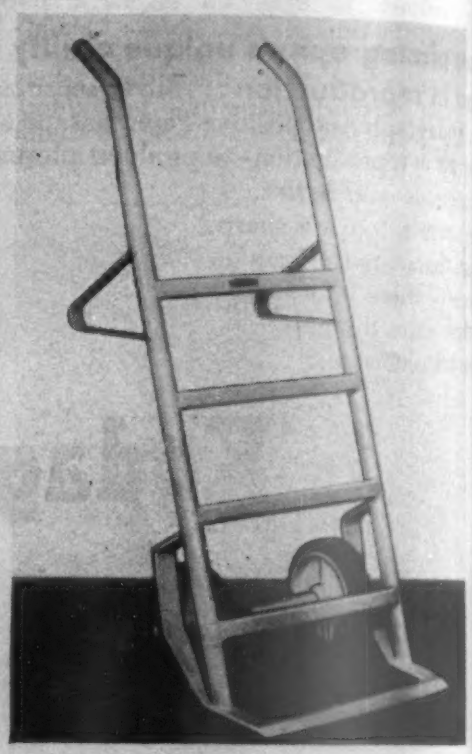

Hand Truck

Two-wheeled warehouse-type hand truck, called FloorMaster Steeler, has all-steel welded frame of tubular construction. Furnished with either straight (for cases and boxes) or curved (for barrels and drums) channel cross bars. Two handle lengths available; choice of semi-steel, rubber-tired, or Celoron tires. Lewis-Shepard Products, Inc., 275 Walnut St., Watertown 72, Mass.

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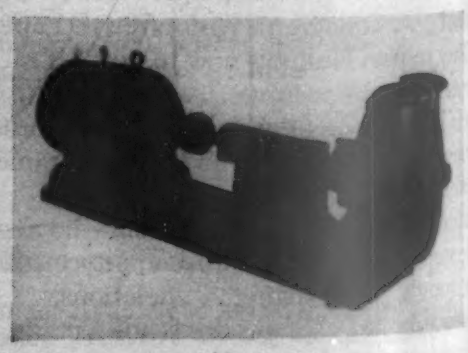

Vacuum Pump

Stoneware 2½-in. vacuum pump is of the rotary seal type. It is built to handle corrosive gases (with the exception of hydrofluoric acid and caus-

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WRITE US ABOUT YOUR PROBLEM OR CHECK THE SUBJECT WHICH INTERESTS YOU AND MAIL THE COUPON.

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Without obligation, please send us information about the items we have checked.

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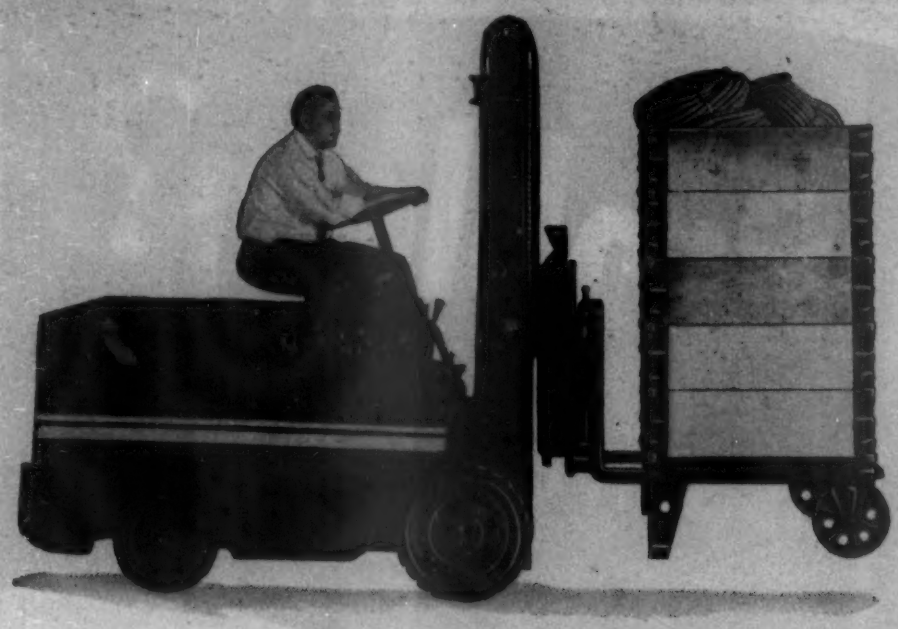
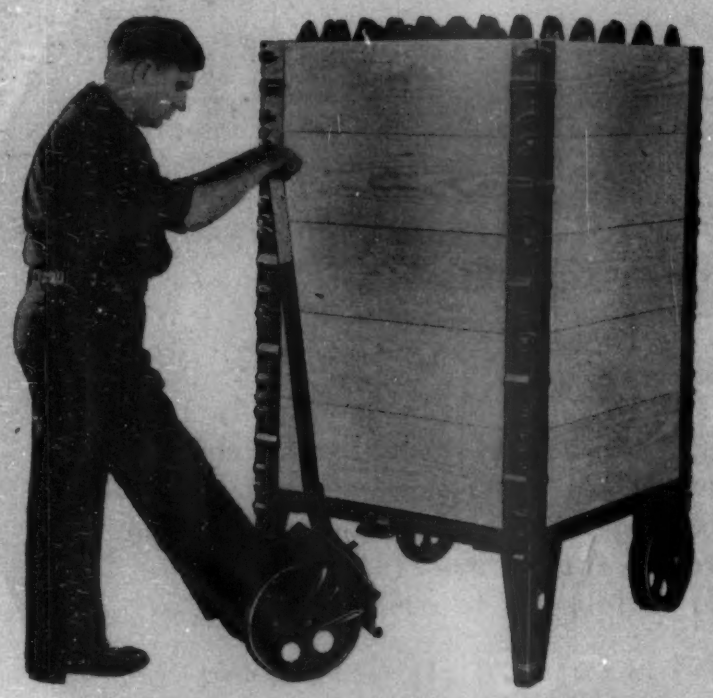
Atten._____ Title_____



DOUBLE LIFT TRUCK EFFICIENCY

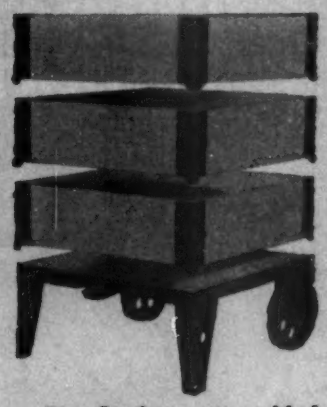
WITH

THE TURNER SYSTEM OF MATERIALS HANDLING



- ***Streamlined Storage***
- ***To-the-ceiling Stacking***
- ***Instant Mobility***

Every unit in the Turner System is designed to work with lift trucks for increased efficiency. Bins themselves are delivered to save handling. Both Pallets and Transports accommodate Wooden-side or All-steel Bin Sections, Racks, Trays and Die Tables. Transports save waiting time on short hauls.



The Turner Transport is moved by hand Jimmy, power lift truck, crane or tractor — works WITH your present methods and improves them. The Turner System cuts labor, handling and storage expense, speeds production and reduces accidents.

Bin Sections are added as load increases, removed as load diminishes —always the RIGHT SIZE bins. Material is concentrated in vertical loads within easy reach of operators.

The rugged, 8-way accessibility Turner Stacking Pallets save replacement costs because they last indefinitely, stand up for years under hard usage.

FREE Book Describes the TURNER SYSTEM

Hundreds of manufacturers have benefited from this book which points the way to greater profit by reducing handling costs. Sent FREE upon request. No salesman will call, unless you specifically ask for one.

Write today for your copy of the Turner System Book and details of the 60 Day Trial Offer

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4605 NORTH TWENTY-FIRST STREET — **MILWAUKEE 9, WISCONSIN**

tic alkalis under positive and negative pressures up to 1 atmosphere for vacuum and 2 atmospheres for pressure. Furnished with either direct or belt drive stoneware separators, and cooling coils. General Ceramics Co., Keasbey, N. J.

•

Repair Alloy

Low-temperature bronze-base permanent repair alloy, called Lo-Temp, handles like putty at 300 degrees and fuses with the metal surface under repair. Manufacturer states that the finished repair can be machined, filed, drilled, or tapped, and that the material will not corrode, run, crumble, shrink, or dry out. It can be used with any metal excepting aluminum or its alloys, and resembles brass in machining qualities. It is not intended as a substitute for welding, but is primarily a strong metal filler, which, under tension, is said to be as strong as the bond fused with the repaired surface. A gasoline torch and a putty knife are the only equipment necessary. May be used to repair pumps, scored cylinders, defective castings, cracked water jackets, steam and water pipes, or defective or broken parts which otherwise would have to be discarded. Illustration shows a typical pump repair. The John Hewson Company, 70 Wall St., New York 5.

•

Photocopy Machine

High-speed photocopy machine is said to make 400 8½x11-in. copies

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It's a DeVilbiss spray gun, heart of DeVilbiss finishing systems—ready to work for you faithfully, efficiently and economically—day after day, year in and year out.

When you put this employee on your finishing department payroll, mounting costs that plague production and curtail sales will decrease. Years of continuous spray experience in industry after industry equip this versatile worker to end costly time-consuming methods . . . to conserve man-hours . . . to stop material waste . . . to knock the bottom out of finishing costs . . . and to improve the beauty and durability of your products.

Your DeVilbiss engineer will gladly bring this efficient producer around for an introduction. A brief interview at your convenience will quickly convince you—this worker has what it takes to finish your products better, faster and at lower cost.

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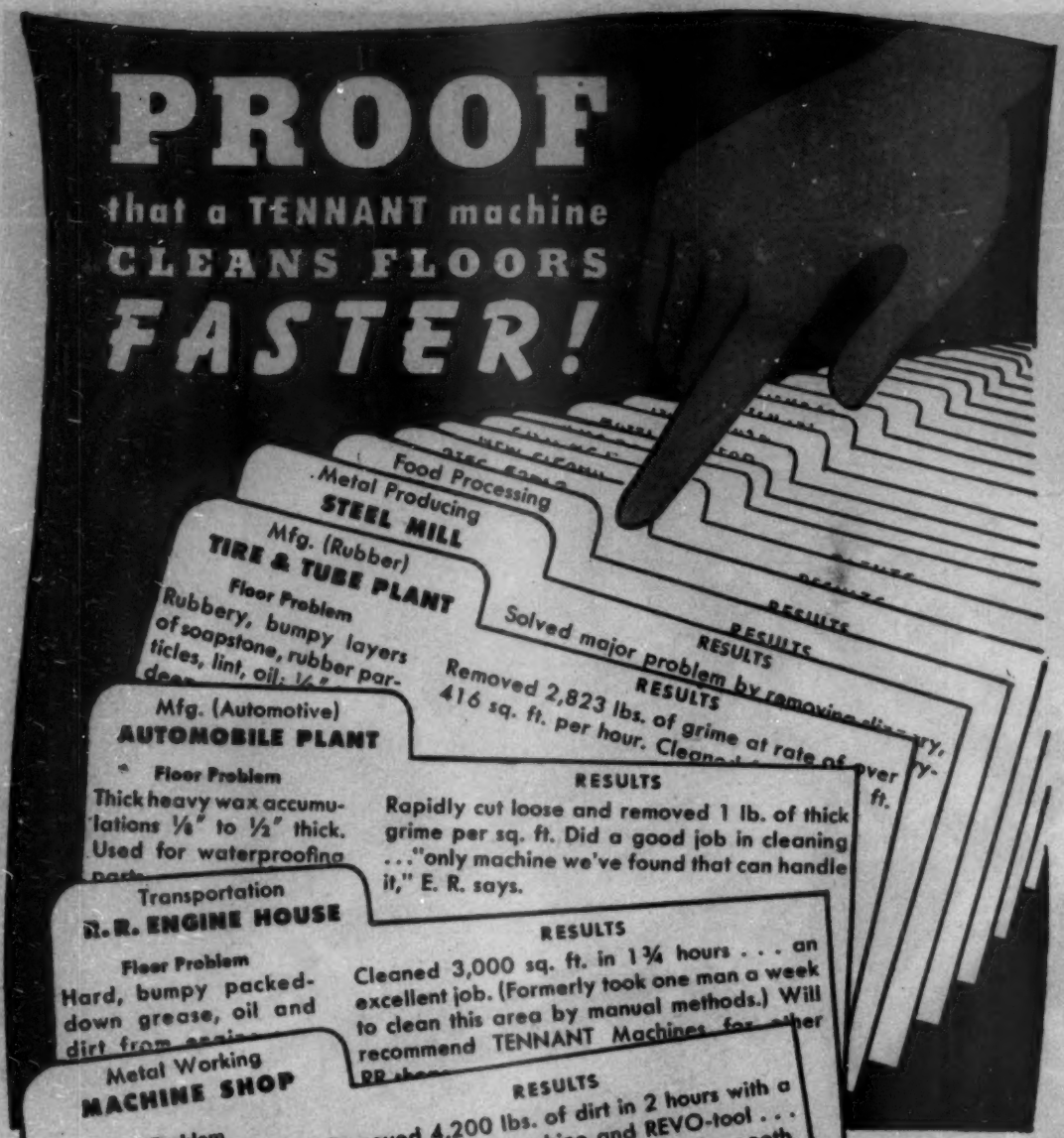
DE VILBISS

means Quality *in all four . .*

SPRAY EQUIPMENT
EXHAUST SYSTEMS
AIR COMPRESSORS
HOSE & CONNECTIONS

PROOF
that a TENNANT machine CLEANS FLOORS FASTER!


Food Processing
RESULTS
Metal Producing
STEEL MILL
RESULTS
Mfg. (Rubber)
TIRE & TUBE PLANT
Floor Problem
Rubbery, bumpy layers of soapstone, rubber particles, lint, oil. ¼"
RESULTS
Solved major problem by removing
Removed 2,823 lbs. of grime at rate of over 416 sq. ft. per hour. Cleaned
ft.
Mfg. (Automotive)
AUTOMOBILE PLANT
Floor Problem
Thick heavy wax accumulations ⅛" to ½" thick. Used for waterproofing
RESULTS
Rapidly cut loose and removed 1 lb. of thick grime per sq. ft. Did a good job in cleaning . . . "only machine we've found that can handle it," E. R. says.
Transportation
R. R. ENGINE HOUSE
Floor Problem
Hard, bumpy packed-down grease, oil and dirt from
RESULTS
Cleaned 3,000 sq. ft. in 1¾ hours . . . an excellent job. (Formerly took one man a week to clean this area by manual methods.) Will recommend TENNANT Machines for other
Metal Working
MACHINE SHOP
Floor Problem
Heavy impacted grime, grease and steel chips. Depth: 1/16" to ½".
RESULTS
Removed 4,200 lbs. of dirt in 2 hours with a TENNANT Floor Machine and REVO-tool . . . cleaned 15 sq. ft. in 1 minute. Left smooth, hard, level surface.
"Fastest method
F. . . . . said. "Solves
lems . . . saves time

TENNANT

INDUSTRIAL

FLOOR MACHINE

- Requires only one man.
- Picks up soilage as it goes.
- Leaves floor smooth, hard, DRY; no water or chemicals.
- Saves man-hours.
- Cleans during working hours.
- Has high speed accessories for ALL types of grime.

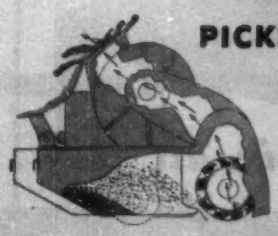
As hundreds of case histories prove, many leading industries now know that **there's no faster way to remove packed-down grime** from floors . . . than with a TENNANT Floor Machine.

It's powerful (up to 10 h.p.) . . . easy to operate . . . and is expressly designed for extra-fast heavy duty work.

CUTS GRIME LOOSE with high speed steel wire brush or REVO-tool.

SMOOTHS, LEVELS surface, leaving floor clean, dry and ready for traffic.

PICKS UP SOILAGE to eliminate need for sweep-up.



PICKS GRIME UP!

Revolving steel wire brush or REVO-tool instantly pulverizes grime . . . cuts it loose from floor . . . hurls it into built-in hopper. Vacuum system controls dust.

Write Today! Get reprints of just-published magazine articles . . . tells how to cut floor cleaning costs with Tennant equipment.

G. H. TENNANT CO.
2554 N. 2nd Street
Minneapolis 11, Minn.

The way to finer floors
TENNANT
Floor Maintenance System

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per hour direct from originals up to 18 inches wide, any length. Copies written, printed, typed, drawn, blueprinted, or photographed material, claims maker. Original and photocopy paper are placed together in the machine; continuous canvas belt and revolving glass cylinder keep them under constant even pressure and prevent slipping. American Photocopy Equipment Co., 2849 North Clark St., Chicago.

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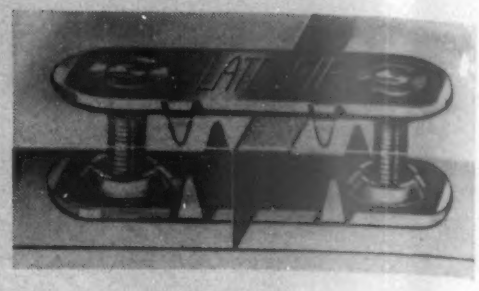

Belt Fasteners

For heavy duty conveyor belts, two-sided plate-type fasteners, called Plategrip, are said to pull belt ends together into a flat, flexible, tight joint that permits use of both sides of belt. Made of heavy-gage steel and individually spaced, devices are suitable for use on belts from ¼ to 1½-in. thick. Armstrong-Bray & Co., 5364-76 Northwest Highway, Chicago.

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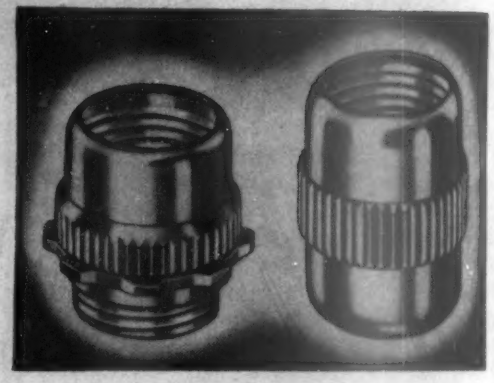

Conduit Fittings

One-piece, cadmium-finished steel conduit fittings have a tapered thread that acts as a die, cutting its own threads on the tubing when screwed into locking position, and resulting in a tight connection that will withstand severe pulling and provide a positive ground, according to manufacturer. Units are furnished with knurled grips, but may be obtained with hex grips. Briegel Method Tool Co., Galva, Ill.

•

Air Conditioners

Line of eight central system air conditioners includes vertical floor-type and suspended horizontal models. Nominal refrigerating capacities range from 5 to 40 tons; will circulate from 2400 to 9000 cubic feet of air per minute, according to manufacturer. Besides cooling, dehumidifying, cleaning, and circulating air, units may be equipped with heating

coils to provide year-round air conditioning. Cabinets are of sectional type, heavy-gage steel. Fan section can be installed to discharge conditioned air in any direction required. Frigidaire Div., General Motors Corp., Dayton 1, Ohio.

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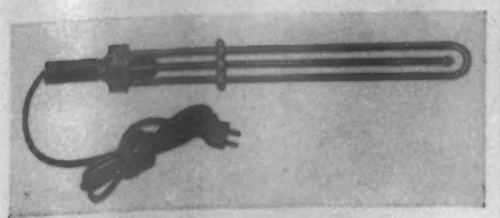

Immersion Heater

With adjustable thermostat control, automatic immersion heater, called Chill-Chaser, maintains any temperature to within 1 deg. F. tolerance, according to manufacturer. Used in tanks, kettles, tumblers, and similar equipment where liquids absorb all heat generated. Safety cutout is said to prevent overheating or burning out when not immersed in solution. Stainless steel immersion rod lengths are 5, 8, 10, 15, and 20 inches. Rated at 1000 watts; plugs into standard 110-volt a.c. outlet. The Still-Man Co., 433 E. 164th St., New York.

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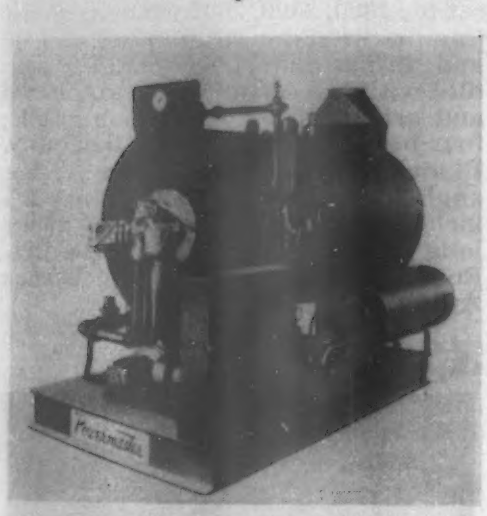


Steam-Generating Unit

Called Powermaster, unit burns either light or heavy oil or gas for heating, processing, or steam or power generation. All three fuels are burned with the same burner, with no change-over of equipment. Automatic boiler system ranges from 15 to 200 horsepower. Other features are said to be modulated control of flame-volume to maintain constant steam pressure as steam demand varies; free-swinging rear cover which provides access to tubes for cleaning. Safety features include an electronic fire-eye for oil, and a flame rod, for gas, which automatically shut off the boiler in case of flame failure. Orr & Semblower, Reading, Pa.

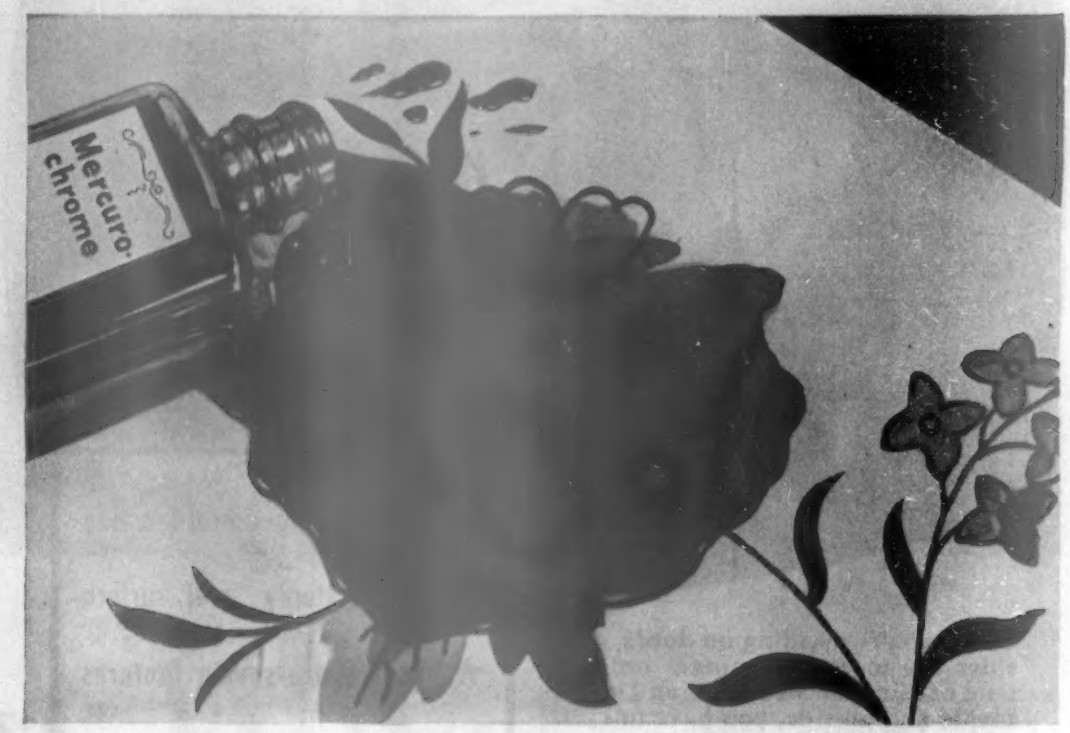
•

Fire Extinguisher

Liquid-type foam, used for extinguishing fires involving gasoline, benzol, and similar flammable materials, is available in 5-gal. cans. Manu-

We Invite You to Accept this CHALLENGE!

We want 10,000 Skeptics to smear, splatter, write or even walk on Stainproof Varlar and try to mutilate the first-day beauty of this durable, washable wall covering.



WE SAY you can splatter, smear, write or even walk on Stainproof Varlar —then wash this revolutionary wall covering sparkling-fresh with ordinary soap and water.

Just try to mutilate Varlar's fresh, stainproof beauty. Laboratory tests and actual use prove that oil, ink, grease, jam, crayon, lipstick—STAINS OF ALL KINDS—wash off Varlar quickly, easily with ordinary soap and water.

Even 25,000 washings can't damage Varlar's life-long stainproof beauty. That's because Varlar is made by an entirely new process. Has no surface coating to crack and peel. No brittle, plastic "skin" to chip or discolor. Varlar's rich, new coloring and stain resistance go *clear through*, last for life.

All 93 stunning styles go up easily as wallpaper, resist water, fire, bacteria and vermin, too! Florals, plaids, weaves, pictorials, stripes and solid tones offer durable new wall beauty, cleanliness and protection for every private or commercial need.

But don't take our word for it! We dare you to test amazing Stainproof Varlar for yourself. Splatter, smear, write or even walk on it. Then quickly, easily wash it clean with ordinary soap and water. Mail the attached coupon for your test size sample of Stainproof Varlar right away.

Never Before Such Enduring Beauty

VARLAR

Stainproof Wall Covering

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DIVISION OF UNITED WALLPAPER INC. CHICAGO

ACCEPT THIS CHALLENGE, NOW!

VARLAR, Inc., Dept. FM-108
Merchandise Mart, Chicago 54, Illinois

I'll take your dare! Send my free sample of stainproof Varlar and I'll test it for myself.

*Name*_____

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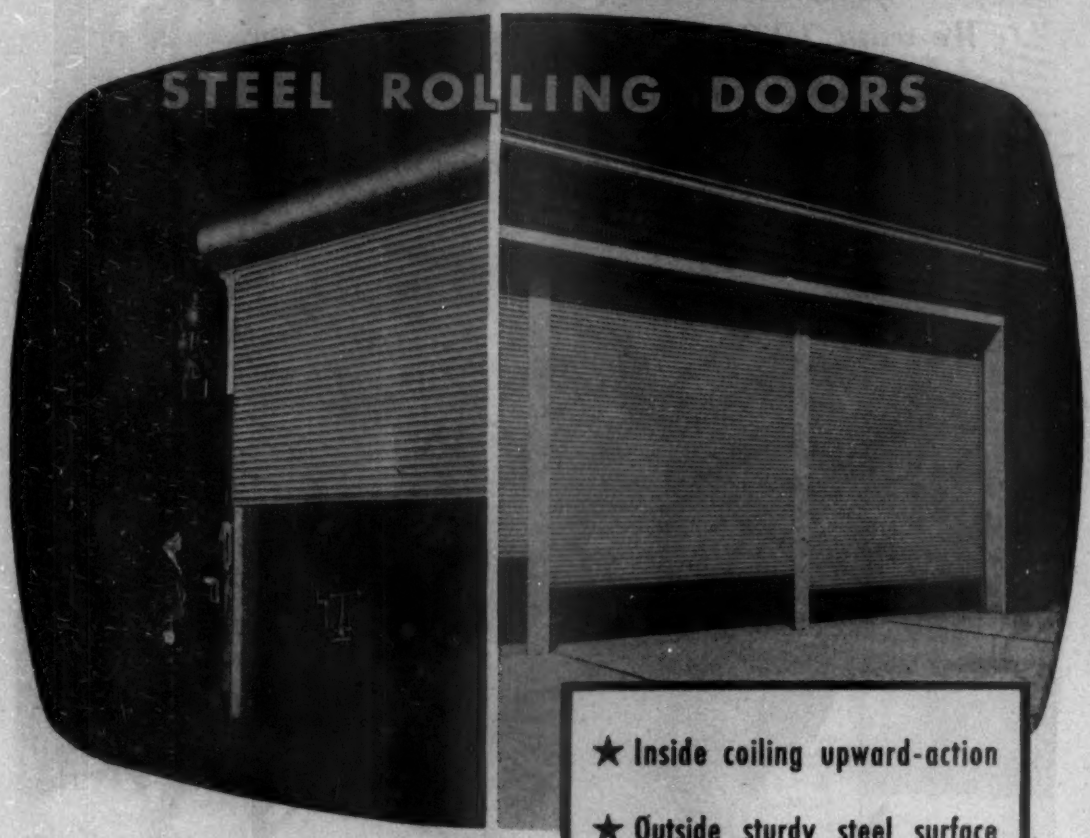
*City*_____ *Zone*____ *State*_____

Look at *Both Sides* for extra advantages of

KINNEAR



★ Inside coiling upward-action

★ Outside sturdy steel surface

★ Inside space-saving features

★ Outside unobstructed opening

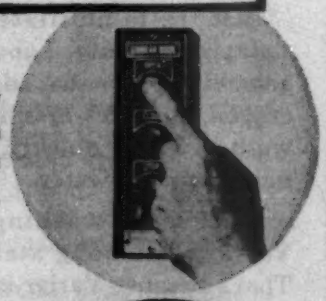
★ Inside easy-to-reach control

★ Outside attractive appearance

When you're deciding on doors, consider the many advantages on *both sides* of Kinnear Steel Rolling Doors. Inside and outside, you have full use of all wall and floor space at doorways. The *interlocking-slat* steel curtain rises *straight upward;* opens and shuts smoothly and easily. It coils in a compact roll above the doorway, completely out of the way; out of reach of wind or vehicle damage. When shut, Kinnear Rolling Doors are all-metal barriers against fire, storm, theft, and intrusion.

These rugged Kinnear Rolling Doors give long-time, low-maintenance service. Their modern straight-line design blends with all architectural styles. They are individually engineered to fit any size opening in new or old structures. For fullest operating ease and time-saving convenience, install Kinnear Rolling Doors with instant-acting Kinnear Motor Operators and push-button controls. (Manually operated doors easily motorized, too.)

Inside and out, Kinnear Rolling Doors combine all features that save manpower, reduce heating and air-conditioning costs by promoting prompt door closure, and extend plant efficiency right up to the doors. Write today for details.



Remote control by push-button from any point saves you time, steps, effort.

Husky KINNEAR Motor Operator lifts, lowers, stops door electrically.

The KINNEAR Manufacturing Co.

FACTORIES

1540-60 Fields Ave. • Columbus 16, Ohio

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Saving Ways in Doorways

KINNEAR ROLLING DOORS

facturer states that for effective results it may be used through an eductor which automatically proportions 6 parts of the liquid to 94 parts of water at any point in the hose line. Rockford Sprinkler Co., 38 Harlow St., Worcester 5, Mass.

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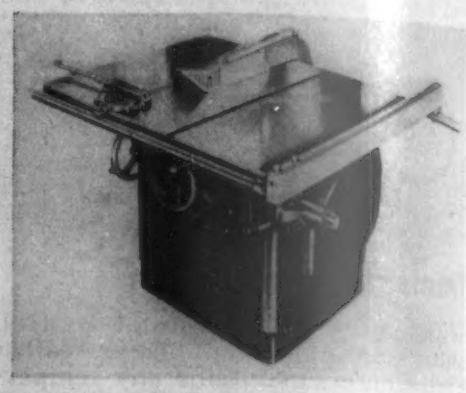

Tilting Arbor Saw

Capable of cutting through 4⅛-in. stock on a square cut, 12-in. tilting arbor saw has, according to its manufacturer, a capacity comparable to that of a saw with a 16-in. blade. It does straight ripping, cutoff work, miter cutting (simple or compound), rabetting, grooving, tongue and groove work, dadoing, sticking, shaping, and other operations. Used with either a 3- or 5-hp. motor, saw can be set for 1800, 2400, 2600 r.p.m. or more. Can be used for aluminum, carbon, and similar materials difficult to handle with an ordinary saw. Motor and arbor are on a common cradle; four-belt drive provides flexibility. Blade may be tilted at a 45-deg. angle, at which it can cut stock 2⅞ inches thick. Work table is 38 inches long by 4 feet wide. Delta Mfg. Div., Rockwell Mfg. Co., 600 East Vienna Ave., Milwaukee 1.

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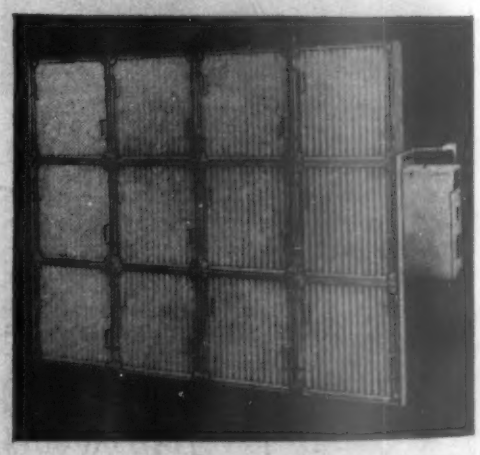
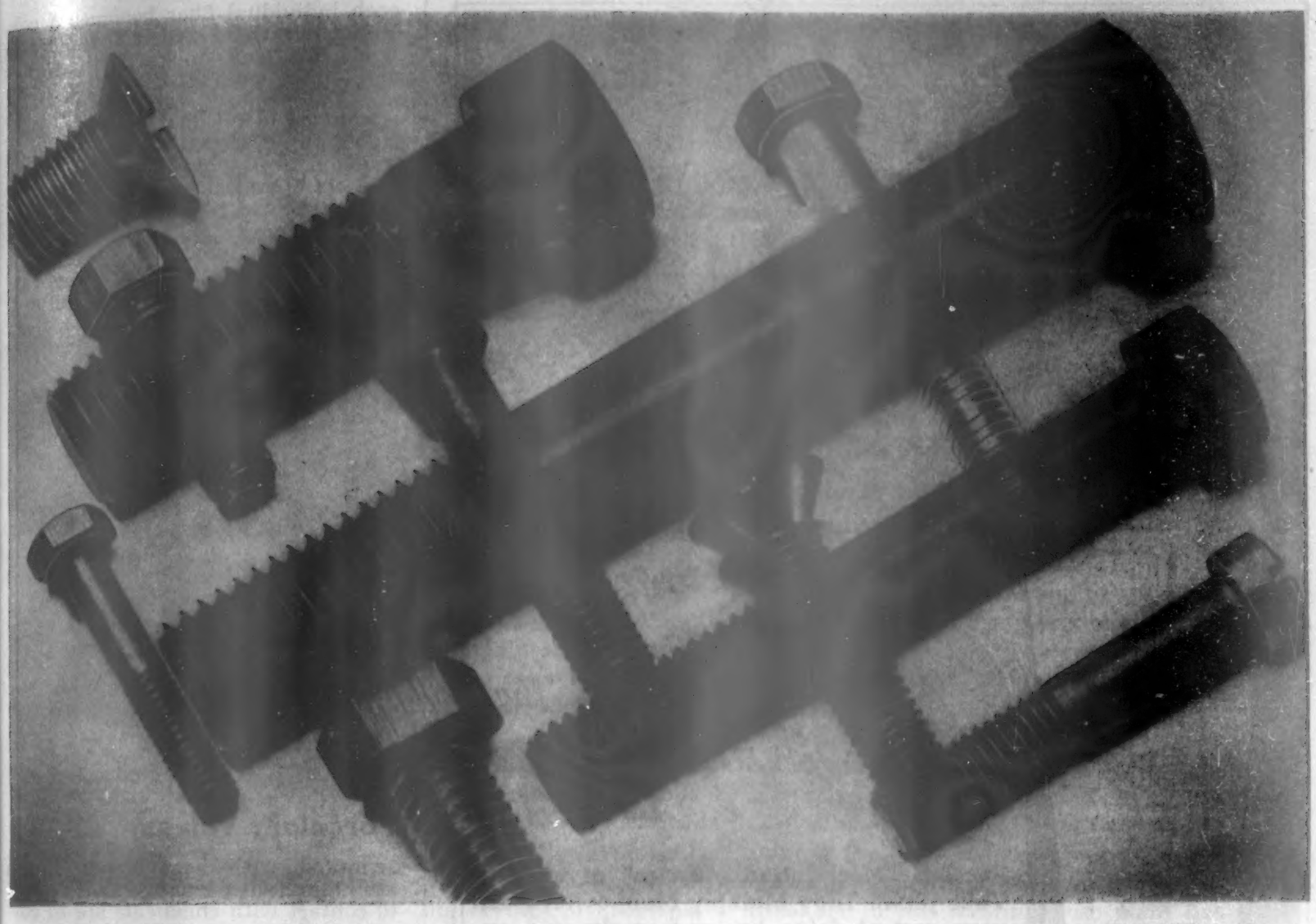


Electronic Air Filter

Known as the Electro-PL, electronic air filter was developed for use where the efficiency of a mechanical filter is too low and that of an electronic precipitator is unnecessarily high. It is basically an electronic precipitator, without an ionizing unit, and contains a collector element of electrostatically charged Airmat paper. Paper is a laminated cellulose product composed of a number of plies of porous, tissue-like sheets formed of short fibers. When an electrostatic charge is applied to the paper, the plies tend to separate, and



IT'S "t.f.e."

TO FASTEN QUALITY WITH QUALITY

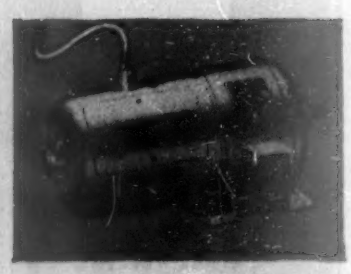
Purpose of a fastener is to fasten. So the cheapest fastener is the one that fastens *best*, with minimum time for assembly, maximum holding power per dollar, and the ultimate contribution to the finished product's appearance.

Manufacturers of machinery and equipment have learned that specifying RB&W Cap Screws saves money all along the line. RB&W's investments in spheroidizing furnaces to improve structure of high carbon and alloy steels . . . mills to draw its own wire to closest tolerances . . . atmospheric-controlled furnaces for scientific heat treatment . . . are as important as the modern production machines in contributing to *True Fastener Economy*.

On *any* problem involving bolts, nuts, screws, rivets or specials, RB&W engineers will help you attain *True Fastener Economy*.

DESIGNING FOR T.F.E. Correct use of RB&W Cap Screws often permits reduction in number and size of holes, saving time and increasing strength of assembly.

CAP SCREWS FOR SEVERE SERVICE. Uniformly high strength, maximum toughness and adherence to close tolerances equip RB&W Cap Screws for severe stress conditions.



SUPERIOR APPEARANCE. The superior finish of RB&W Cap Screws enhances the appearance of the assembly and contributes to the sales value of the final product.

t.f.e.

TRUE FASTENER ECONOMY IS THE LOWEST TOTAL OF ALL FASTENING COSTS

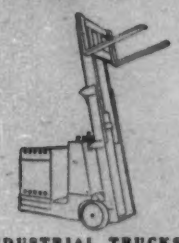
RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY

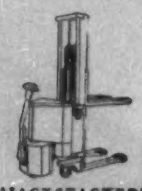
BOLTS • NUTS • SCREWS • RIVETS
RB&W
THE COMPLETE QUALITY LINE
& ALLIED FASTENING PRODUCTS

Plants at: Port Chester, N. Y., Coraopolis, Pa., Rock Falls, Ill., Los Angeles, Calif. Additional sales offices at: Philadelphia, Detroit, Chicago, Chattanooga, Oakland, Portland, Seattle. Distributors from coast to coast.

103 Years Making Strong the Things That Make America Strong

Buy at the Sign of
THE "MASTER" LINE
OF
MATERIALS HANDLING EQUIPMENT
Designed, Engineered, Manufactured and Distributed under this Internationally Known Trade Mark.


INDUSTRIAL TRUCKS


"JACKSTACKER"

"JACKLIFT" POWER MODEL

HYDRAULICS

"JACKLIFT"

"REDILIFT"

SKID PLATFORMS

FLOOR TRUCKS

STACKERS

The Sign of The "MASTER" LINE

Put L-S "Mechanized Muscles" at work in Your plant. They Multiply Manpower, slash your cost of doing business, make you another of the hundreds of thousands of friends of the "MASTER" LINE.

No matter what your plant layout, your width of aisles, your type of materials, your storage or production set-up . . . there's a "MASTER" LINE product or combination of products to solve your handling problem and pay for itself over and over again. Let's get together.

Send for this 86 page Catalog of THE "MASTER" LINE

ESTABLISHED 1915

LEWIS-SHEPARD
PRODUCTS INCORPORATED
314 WALNUT STREET
WATERTOWN 72, MASS.
REPRESENTATIVES IN PRINCIPAL CITIES — CONSULT YOUR PHONE DIRECTORY

each individual fiber becomes a collecting electrode which attracts and holds dust and smoke particles, according to manufacturer. Filter paper may be replaced when it has accumulated a full load. Manufacturer states that the unit will continue to function even when de-energized, so that its operation may be varied to suit conditions, as an air cleaner during smoky winter months, and as a dry-type air filter during the hot summer. American Air Filter Co., Inc., 215 Central Ave., Louisville 8, Ky.

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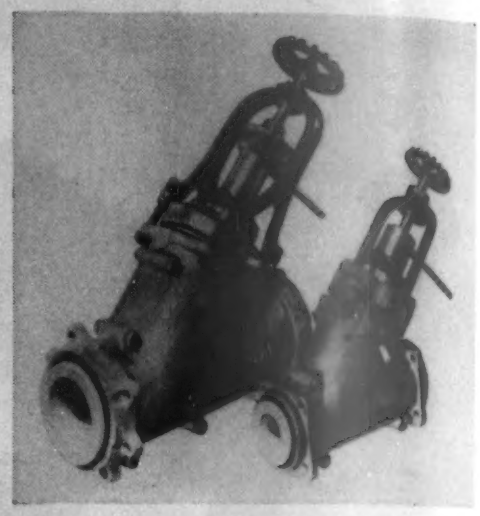


Porcelain Valves

Armored with heat-treated silicon aluminum, all parts of valve subject to contact with chemicals are of corrosion-resistant porcelain. Line of Y valves is available in 1-, 1½-, 2-, 3-, 4-, and 6-in. sizes; angle valves in 1- and 2-in. sizes; and flush valves for 1½-, 2-, and 3-in. sizes for 3-, 4-, and 5-in. outlets respectively. Standard 125-lb. flanges are integral with armor; porcelain faces are machine ground flat for gasketing. Lapp Insulator Co., Inc., Process Equipment Div., LeRoy, N. Y.

•

Air Meter

Portable three-way meter, called Anemotherm, gives air velocity, air temperature, and static pressure readings

Pittsburgh Cargotainers save $35. per carload handling castings at Westinghouse

OLD METHOD

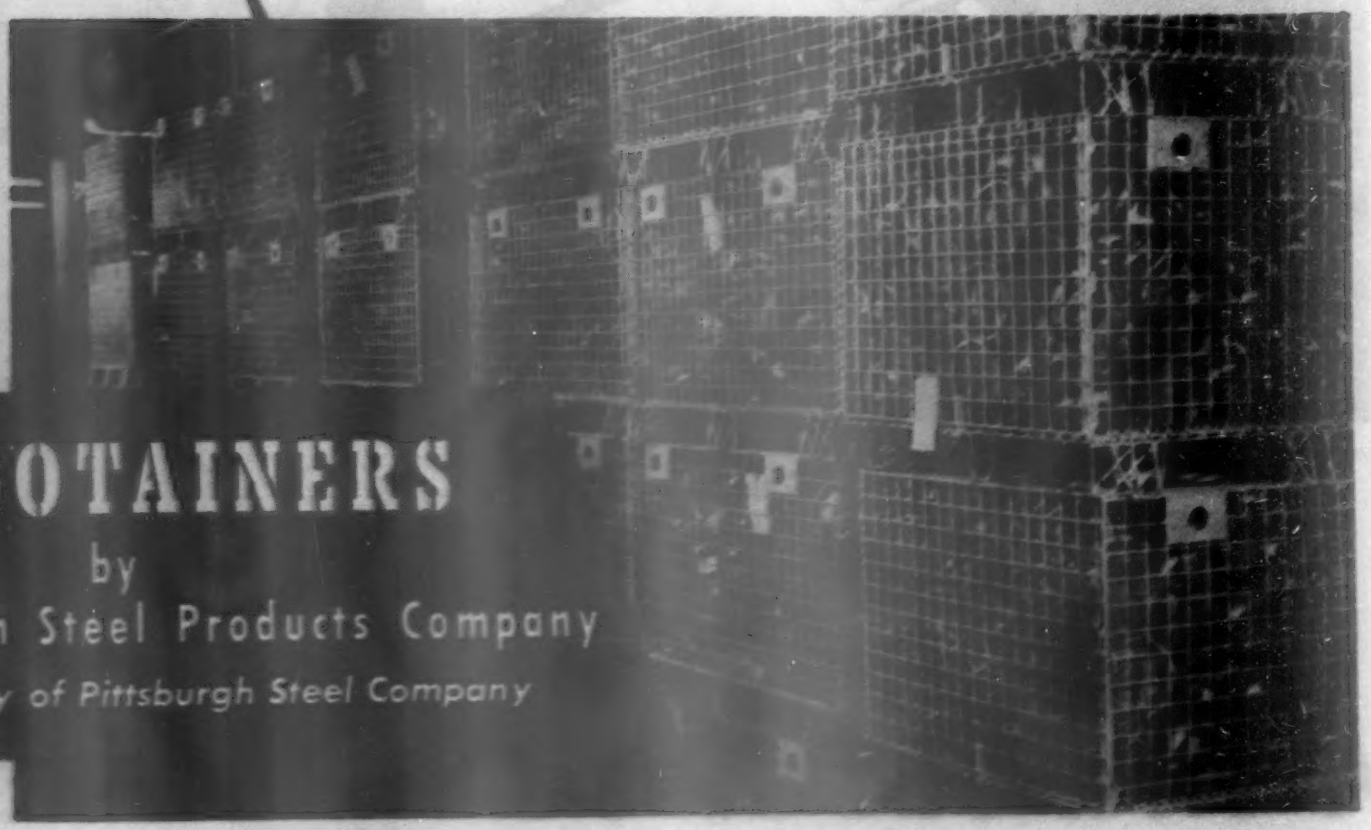
You can save with Cargotainers just as Westinghouse is doing at its Small Motors Division, Lima, Ohio. Formerly, bracket castings were unloaded by hand from railroad freight cars into skidboxes. These were carried to the storeroom by electric truck and unloaded by hand into wooden bins. This took one man 48 hours—it cost $41.00.*

Now the castings are received in collapsible wire Cargotainers. The same electric truck picks up the containers of castings from the freight car and unloads it in only 3½ hours at a cost of merely $6.00—a net savings of $35 per carload. In addition Pittsburgh Cargotainers have made possible several other savings—the old wooden bins are out and castings are now kept in Cargotainers tiered four-high until used—a big savings in floor space. Breakage in the Westinghouse plant has been eliminated as has the demurrage on freight cars. Better inventory and accounting is possible. Work is scheduled without delay. These are all extra savings not included in the $35 saved on handling alone.

If you want to save money on your materials handling, it will pay you to investigate Pittsburgh Cargotainers. Write to Pittsburgh Steel Products Company, 3257 Grant Building, Pittsburgh 30, Pa. for information.

**From "Better Handling Nets Important Savings" Factory Management & Maintenance, February 1948.*

MODERN CARGOTAINER METHOD



CARGOTAINERS

by

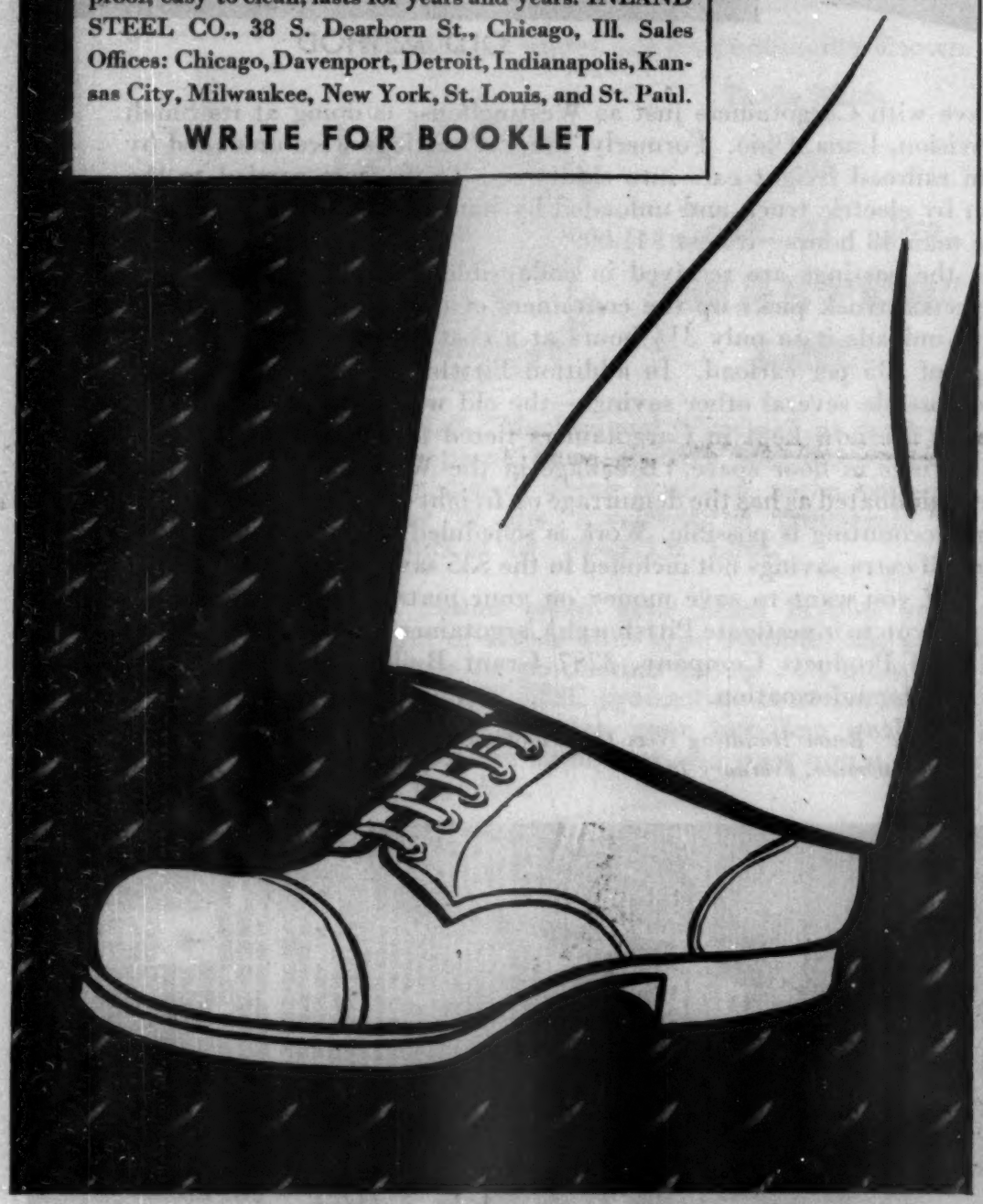
Pittsburgh Steel Products Company

Subsidiary of Pittsburgh Steel Company

Step Out...Safely

You can put your best foot forward—*without slipping*—when the flooring in your plant is Inland 4-Way Floor Plate. Its skid-resistant pattern provides built-in protection wherever production feet or wheels must go . . . floors, steps, ramps, platforms. Made of steel, it's fireproof, easy to clean, lasts for years and years. INLAND STEEL CO., 38 S. Dearborn St., Chicago, Ill. Sales Offices: Chicago, Davenport, Detroit, Indianapolis, Kansas City, Milwaukee, New York, St. Louis, and St. Paul.

WRITE FOR BOOKLET



INLAND

Stocked by Leading Steel Warehouses

4-WAY FLOOR PLATE

at the turn of a knob. It measures air velocity from 10 to 1500 f.p.m., provides rapid-response measurement of temperatures from 30 to 155 deg. F., according to manufacturer. Either negative or positive static pressure may be read directly in inches of water, from 0.05 to 10 positive and 0.05 to 4 negative. Because it measures air velocity regardless of direction of air flow, manufacturer says it can provide data on low air movement of a turbulent nature, and that velocity readings are not influenced by any normal static pressure. The probe is small, and attached to a long flexible cable. Meter operates on self-contained batteries, and weighs 11 pounds. Suitable for use in adjusting and testing heating, ventilating, and air conditioning equipment, and for measuring velocity and temperature of air confined in ducts, air currents in free spaces, and air entering or leaving through air outlets and inlets. Anemostat Corporation of America, 10 East 39th St., New York 16.

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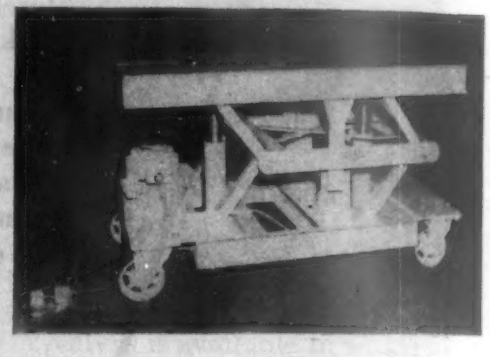

Sheet Feeding Table

With a 10,000-lb. capacity and a 16-in. range of elevation, hydraulic-lift sheet-feeding table, Model 66, has a 36x66-in. top. Side and end extensions increase work area to 48x96 inches. Unit has lowered height of 26 inches and elevated height of 42 inches. Two 10-in. rear wheels and two 8-in. swivel casters in front are standard equipment, which also includes a two-speed foot pump with 5 feet of hydraulic hose and a floor lock. Lyon-Raymond Corp., 6183 Madison St., Greene, N. Y.

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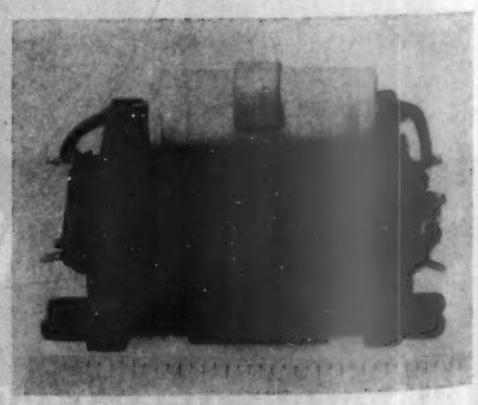


Voltage Stabilizer

Five-watt stabilizer, designed to be incorporated in electronic equipment where space and weight limitations are critical, operates at input voltage

HOW TO BEAT HIGH FUEL COSTS!

Users of GRINNELL THERMOLIERS report savings up to 35%*

To maintenance men who figure savings in tenths of cents, a saving of up to 35% in heating costs is a windfall in these days of high fuel prices and tight supply.

A Thermolier installation will assure you of proper heat *at the working level,* not banked uselessly near the ceiling, and it will do it at the lowest possible fuel cost. Thermolier's 12 points of superiority make it the best "heat machine" on the market.

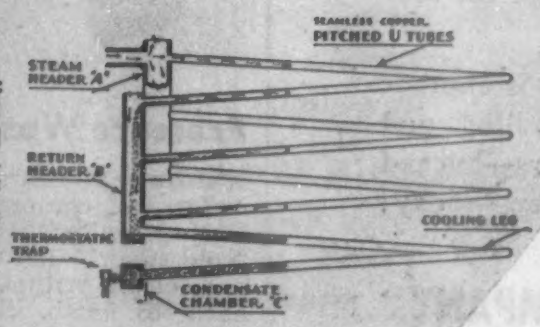
Get in touch with Grinnell or your local Thermolier Distributor at once. See for yourself how Thermoliers may effect this kind of savings in your fuel bills.

*A Railway and Dock Shop reports savings of 35%.

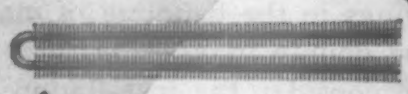
A well-known manufacturer . . . 29%.

A large manufacturer operating more than 50 plants . . . 30% average.

WHAT THERMOLIER'S SUPERIOR FEATURES MEAN TO YOU:

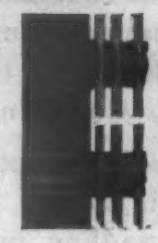


Plain thermostatic trap, the simplest and least expensive kind of trap, made practical because of Thermolier's exclusive internal cooling leg.



Damaging strains caused by expansion and contraction eliminated by "U" type expansion tubes.

Maximum capacity provided at all times and annoying and destructive water hammer eliminated because built-in pitch of the tubes and internal cooling leg assure continuous drainage of condensate.



Safety and durability assured with leak-proof tube-to-header construction.

Additional desirable advantages from eight other features. Write for Thermolier Catalog 6-E.

GRINNELL COMPANY, INC.
Providence 1, R. I.

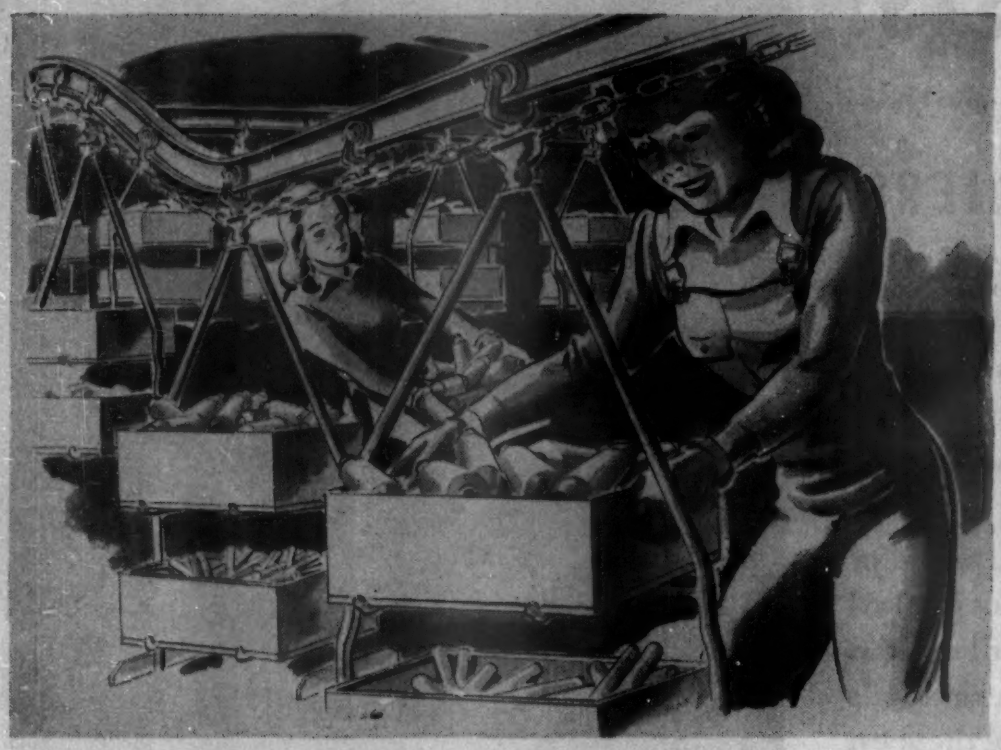
Branch Warehouses

Atlanta 2, Ga.
Charlotte 1, N. C.
Chicago 9, Ill.
Cleveland 14, O.
Cranston 7, R. I.
Fresno 1, Cal.
Houston 1, Tex.
Kansas City 16, Mo.
Long Beach 10, Cal.
Los Angeles 13, Cal.
Milwaukee 3, Wis.
Minneapolis 15, Minn.
New York 17, N. Y.
Oakland 7, Cal.
Philadelphia 34, Pa.
Sacramento 14, Cal.
St. Louis 10, Mo.
St. Paul, Minn.
San Francisco 7, Cal.
Seattle 1, Wash.
Spokane 15, Wash.

GRINNELL

WHENEVER **PIPING** IS INVOLVED

To Reduce Your Costs Throughout Your Plant



Now Is The Time to Install an Alvey-Ferguson ENGINEERED Conveyor System

From the unloading platform, to the shipping department, through the various stages of processing and manufacture, production flows in a never ending stream, because of this A-F Engineered Conveying System.

And now that savings in the handling of materials and products have become doubly important—there is no better time than now to consider the installation of an A-F Completely Co-ordinated Conveying System.

Of course, each plant layout is different. This is another reason you should discuss your materials-handling and products-handling problems with A-F Engineers—backed by 47 years' experience. Write without obligation—today!

47 YEARS OF SERVICE TO INDUSTRY

THE ALVEY-FERGUSON COMPANY

140 DISNEY ST. *Established 1901* CINCINNATI 9, OHIO

Offices or Representatives in Principal Cities—Coast to Coast

CONVEYING EQUIPMENT

A-F CONVEYING MACHINERY

Alvey-Ferguson

METAL PRODUCTS CLEANING EQUIPMENT

of 95 to 130 volts a.c., 60 cycles, single phase. Output is 120 volts stabilized to plus or minus ½ per cent. according to manufacturer. Raytheon Mfg. Co., 60 East 42nd St., New York 17.

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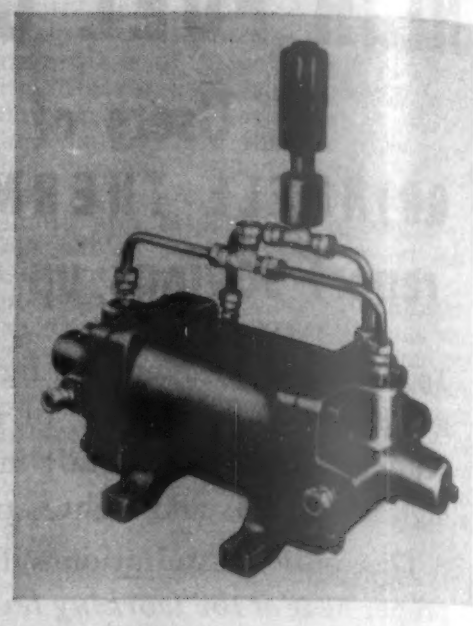

Intensifier

Air-actuated continuously charging intensifier, called Power-petuator, is designed to provide continuous high pressure stroke, and to maintain any pre-set ram pressure, even on compressible materials. Typical applications are molding plastics and rubber, laminating and assembly forcing, forming and gluing, repetitive test work, or other work requiring up to 50-ton pressure. Self-contained, the unit takes its power entirely from the shop air line. Elmes Engineering Works, American Steel Foundries, 1002 Fulton St., Chicago 7.

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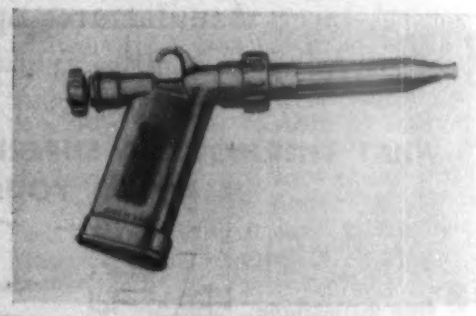

Pressure Washer

Utilizing a controlled mixture of water and compressed air, pressure washer, called Hydro-Air, produces "cold steam" that is said to penetrate and clean without back splash or harm to finish. Suitable for use in metal processing, maintenance, repair, degreasing, and paint stripping. Washer can remove heavy dirt and grease or rinse cleaning solvent from sheets and parts. D & M Products, Inc., 4655 Kingswell Ave., Los Angeles 27.

•

Bag for Glass Containers

Made in standard sizes to fit bottles from one quart up to 5 gallons, "Saf-T-Bag" is designed for the safe handling of filled or empty glass con-

a blade like this

on a machine like this

boosted cutting speed 53%

There's good reason why a change to Atkins "Silver Steel" Powersaw Blades so frequently results in sensationally improved cutting performance.

The Atkins "Curled-Chip" Tooth form, with its inward curved face, actually *lifts* the chip free in a smooth, continuous curling motion. Tooth-dulling heat and power-wasting friction are reduced to a minimum. In addition, these blades are made of Atkins own special analysis "Silver Steel" — the steel that was developed to take an edge and hold it through record cutting periods and consistently heavier feeds.

Why not ask your industrial distributor to arrange a demonstration on your own machines and work?

See your Industrial Distributor First

CUTTING REPORT

Material: 6" dia. No. 94100 Steel (equivalent to Temkin No. 5200)
Cutting time with previous blade: 13 min.
Cutting time with Atkins blade: 8½ min.
Increase in cutting speed: 53%

ATKINS "*Silver Steel*" Hand Hacksaw Blades

The blade that takes the "hack" out of hacksawing. Fast-cutting, easy to work with. Made of "Silver Steel", with tough rugged teeth that hold up without breaking or dulling for many cuts through toughest metals. Ask for the blades with the "Blue Ends".

ATKINS "*Silver Steel*" SAWS

E. C. ATKINS AND COMPANY
Home Office and Factory
402 S. Illinois Street, Indianapolis 9, Indiana
Branch Factory: Portland, Oregon
Branch Offices:
Atlanta • Chicago • New Orleans • New York • San Francisco

AAA TRADE MARK ATKINS "ATKINS ALWAYS AHEAD"

MAKERS OF BETTER SAWS FOR EVERY CUTTING JOB

DARNELL
CASTERS & WHEELS

Choose just the right caster or wheel for your needs from the Darnell line of nearly 4000 types. These precision made casters and wheels will help you speed up production . . . will pay for themselves many times over.

FREE MANUAL

DARNELL CORP. LTD. 60 WALKER ST., NEW YORK 13, N.Y.
LONG BEACH 4, CALIFORNIA 36 N. CLINTON, CHICAGO 6, ILL.

tainers. It consists of an outer jacket of either neoprene coated fabric, flame-proof or plain duck, with or without removable shock-absorbing side and bottom padding. Draw-cord pulls the top snuggly around neck of bottle, rigid bottom disks and carrying handles are securely fastened to the bag. When containers of acid, corrosive chemicals, or hot liquids are being carried, device is claimed to prevent injury should container break, and to enable partial or complete recovery of liquid content. Benson & Associates, Inc., 536 South Clark St., Chicago 5.

•

Magnetic Disk Brake

For fractional horsepower application, magnetic disk brake, Series X-60, is used with 1/6-, ¼-, 1/3-, ½-, and ¾-hp. motors, for continuous or intermittent duty, for alternating or direct current. Suitable for motor or floor mounting, and for horizontal or vertical operation. Stearns Magnetic Mfg. Co., 620 South 29th St., Milwaukee 4, Wis.

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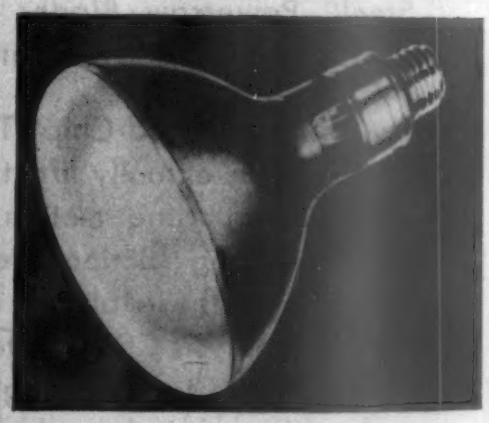


Reflector Lamps

Reflector flood and spot lamps, 50-watt R-40, are designed for use in bullet shaped holders and recessed fixtures. Manufacturer states that they have a rugged, medium skirted mechanical base that cannot come loose, drop out, or sag in such fixtures. Over-all length of the lamp is approximately that of cemented base lamps, so they fit the same fixtures with no change in light distribution, appearance, or operating temperature of the fixture. Champion Lamp Works, Lynn, Mass.

•

Welding Lens

High light reflection and absorption qualities of the Metalklad welding

Save with modern distribution systems using WESTINGHOUSE Dry-Type Transformers

If you are expanding or relighting your plant, you can lower operating costs and gain greater efficiency feeding motors and lights by using a modern distribution system.

In such a system, higher voltages are brought close to the load and are stepped down at the motors and lights they serve with modern, dry-type transformers.

You will:

GET BETTER REGULATION
SAVE COPPER
SAVE INSTALLATION COSTS
REDUCE OPERATING EXPENSES

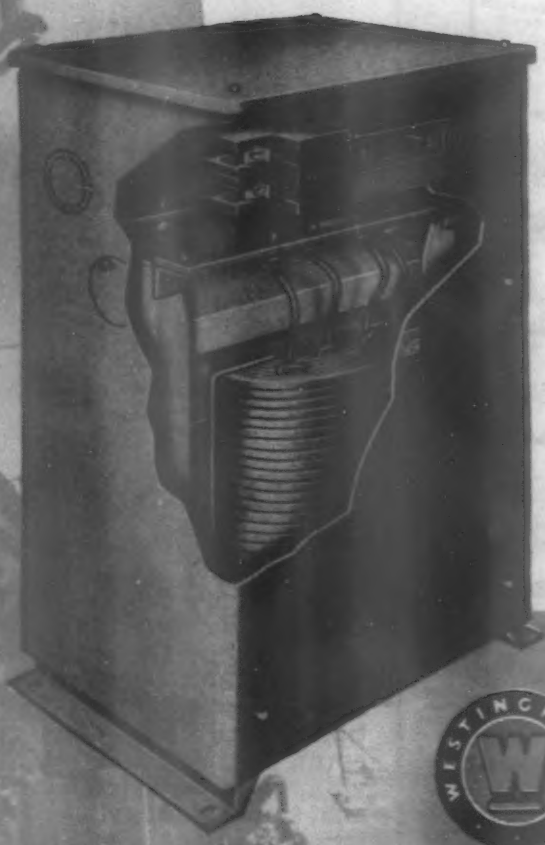
And Westinghouse dry-type transformers will give you additional advantages of **SMALL SIZE AND LIGHT WEIGHT,** important to the men who actually install the transformers.

To get these extra "plus" advantages Westinghouse leadership in engineering introduced Class B insulation and developed HIPERSIL*, the steel that carries one third more magnetic flux.

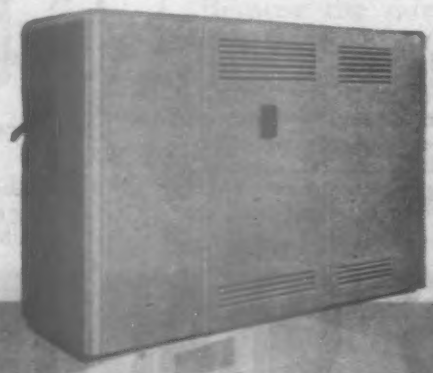
That same engineering is ready to assist you with the proper application of dry-type transformers in the distribution system best suited to your needs. Call or write your near-by Westinghouse office for your copy of Booklet B-4009. Westinghouse Electric Corporation, Transformer Division, Sharon, Pennsylvania. J-7051

*Reg. U. S. Pat. Off.

YOU CAN BE SURE IF IT'S Westinghouse



A NEW FEATURE—Two popular dry types, AJR and AVR, are now offered with or without a built-in circuit breaker. With this new feature, the need for separate protective devices is reduced. AVR-B (with breaker) is shown at left.



ABOVE—Type GP which, with type MT, are small, class A insulation transformers serving loads under 2 kva.

LEFT—Dry-type power center, used indoors as part of modern industrial distribution.

Westinghouse
PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

"LEADERSHIP IN TRANSFORMER DEVELOPMENT . . . FOR EVERY POWER DISTRIBUTION JOB"

No. 2 of a series of questions and answers designed to highlight the extensive and amazing uses of graphite—from pencils to atomic bombs.

SOURCE AND PROPERTIES OF GRAPHITE

QUES. Are all graphites—varying in type, purity and particle size—suitable for the same uses?

ANS. Definitely not. In nearly every case, each application governs the selection of graphite in type, purity and particle size. Lubricants require the crystalline types of highest purity. Electrical applications usually require high purity. The lower purity grades of natural amorphous graphites find less exacting uses.

QUES. What are the characteristics of graphite that make it one of mankind's most useful industrial minerals?

ANS. It is extremely lubricous or slippery, lustrous, oil-and-grease-free (unless processed with such), and withstands excessive heat, cold and pressures. It neither destroys nor is destroyed by contact with water, oil or any chemical. It is electrically conductive, heat conductive, non-magnetic, non-fusible, non-toxic, non-odorous and does not permanently stain. It adheres tenaciously to almost all substances and has a low co-efficient of expansion.

QUES. What was the first product made from graphite?

ANS. Pencils, in 1554.

QUES. Is graphite processed into all required forms and shapes that make it usable for innumerable manual, mechanical, chemical, and electrical applications?

ANS. Graphite owes its remarkable versatility to its almost unlimited scope of form and formulation. It is available in a wide variety of microscopic powders, large flakes, fluids, non-fluids, concentrates, bars, tubes, sheets, plates and specially processed shapes.

QUES. In what products or processes is graphite now principally used?

ANS. Lubricants • Pipe joint seals • Mechanical packings • Gaskets • Brake linings • Sand and metallic molds • Lustrous heat-resisting polishes • Protective coatings • Crucibles and refractories • Electronics • Electroplating • Electrodes • Dry batteries • Motor and generator brushes.

A few of thousands of widely used products containing Dixon's Graphites. Those starred are Dixon's products, many of them sold by supply houses everywhere.

★ Lubricating and Penetrating Oil

★ Pipe Joint Compound

★ Graphite (pipe joint) Seal

Now may we receive *your questions* on how graphite can help *you*?

DIXON'S GRAPHITES

Products of
JOSEPH DIXON CRUCIBLE COMPANY
Jersey City 3, N. J. D Div 44-9-10

LOOK FOR No. 3
in this series. We will gladly send you reprints of any you may miss.

lens are said to eliminate arc glare, increase visibility and welding efficiency, and afford eye protection. Basic dark welding lens is coated on the outside surface with a durable alloy, providing a hard, transparent, mirror-like surface which reflects ultra-violet and infra-red rays given off by the electric arc. American Agile Corp., 5806 Hough Ave., Cleveland 3, Ohio.

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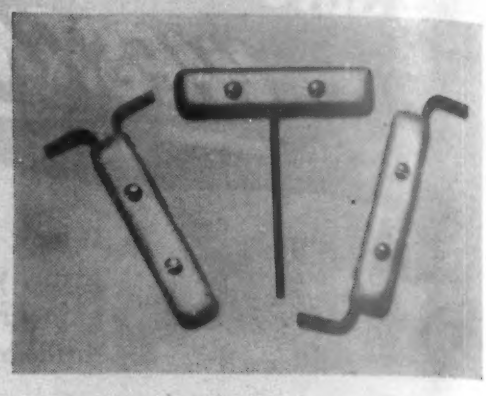

Tool Handle

Aluminum tool handle, called Handy-Handle, is designed to provide a safe grip on socket screw keys or wrenches. The handle weighs 2¾ ounces, and can be changed from one tool to another in less than a minute, according to manufacturer. Two 4-in. half-round pieces, made of aluminum alloy, when fitted together and tightened with two 10x24½ screws, form a comfortable hand grip. Two 120-deg. V grooves run the length of the handle, one deeper than the other, so that two keys of different sizes can be clamped in the handle at one time, and in varied positions. Three transverse grooves accommodate taps, reamers, star drills, files, or a hacksaw blade for blind or contour sawing. Wittle Mfg. Co., 1041 Lititz Ave., Lancaster, Pa.

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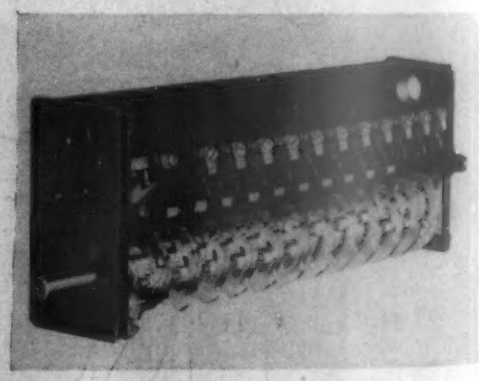


Limit Switch

Heavy-duty rotating cam limit switch, Bulletin 801, is said to open and close up to 12 circuits at any position of the actuating cam shaft. Switches are also available for 3, 4, 6, or 9 circuits. Circuits can be opened or closed in any sequence or elapsed time. Each cam is indexed for accurate setting. Contactors are individually detachable, and the shaft and cam assembly can be removed for adjustment. Switch is adaptable to any programming control or time-sequence operation, according to manufacturer, and is available in

Here is **WHY** the

CONCAVE SIDE

(U.S. PATENT NO. 1813698)

REG. U. S. PAT. OFF.

The Mark of SPECIALIZED Research

SAVES You Many DOLLARS In V-BELT Costs!

Every time a V-Belt bends around its pulley, the *top* of the belt is under *tension* and grows *narrower*. The *body* of the belt is *compressed*—causing the *sides* to *bulge out!*

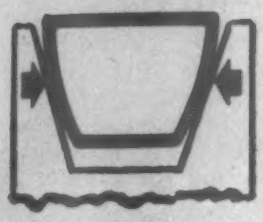


FIG. 1

Because of these stresses, any V-Belt built with straight sides is forced to assume, in the sheave groove, the shape shown in figure 1, on the left.

This forced bulging of a *straight-sided* V-Belt against the sheave groove walls naturally produces excessive wear along the *middle* of the belt's sides—as indicated by the arrows. Also, because the full side of the belt does not *uniformly* grip the pulley, there is a definite loss in drive efficiency.

Now see the difference when you bend the V-Belt that is built with the precisely engineered Concave Side (U. S. Patent No. 1813698)—the Gates Vulco Rope.

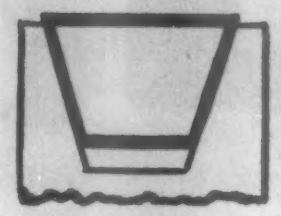


FIG. 2

As the Gates Vulco Rope bends, its Concave Side becomes straight (Figure 2). It exactly fits the sheave groove—and this gives you two very definite savings:—

(1) No out-bulge of the sides means uniform side-wall wear—*longer life!*

(2) *Full side-width* grip on the pulley carries heavier loads and sudden load increases without slippage—saving your belts and saving power too!

The Concave Side is MORE IMPORTANT NOW Than Ever Before!

Because the *sides* of a V-Belt are what actually *drive* the pulley, it is clear that any increased load on the belt means a heavier load that must be transmitted to the pulley *directly* through the belt's sidewalls.

Now that Gates SPECIALIZED Research has made available to you *SUPER* Vulco Ropes—carrying fully 40% higher horsepower ratings—the life-prolonging Concave Side naturally delivers greater savings today than ever before.

4810

GATES VULCO ROPE DRIVES

Engineering Offices and Jobber Stocks IN ALL INDUSTRIAL CENTERS of the U. S. and 71 Foreign Countries

THE GATES RUBBER COMPANY
DENVER, U.S.A.
"The World's Largest Makers of V-Belts"

MATERIAL HANDLING News

Reelected!-- by a ROUSING MAJORITY: the CLARK ELEC-CARLOADER!

Campaigning squarely on its record for versatile usefulness and exceptionally low cost, the Clark Elec-Carloader has been enthusiastically endorsed by World Industry as the outstanding materials handling machine of its kind.

More efficient storage and huge savings of time are obvious benefits of the Clark Method.

The preference it enjoys is a tribute to the Elec-Carloader's usefulness in Industry's program of increasing productive capacity within existing facilities; of accelerating output by speeding the flow of materials through processing, warehousing and transit; and of realizing vast potential savings.

The Elec-Carloader, with its 4000-lb. capacity, is a particularly effective combination of the famous Clark Carloader —outnumbering any other model of fork lift truck manufactured! — and electric battery power, as developed by Clark. Bred into it are Clark's mass production of component parts and of complete machines; Clark's maximum interchangeability of parts; and Clark's unparalleled automotive and materials handling experience.

To get the facts about the Elec-Carloader is to understand the beneficent revolution that is taking place in Industry's handling of materials. They are facts worth knowing, and are readily obtainable from a man worth knowing: a Clark field representative. It's a boon to any business to CONSULT CLARK.

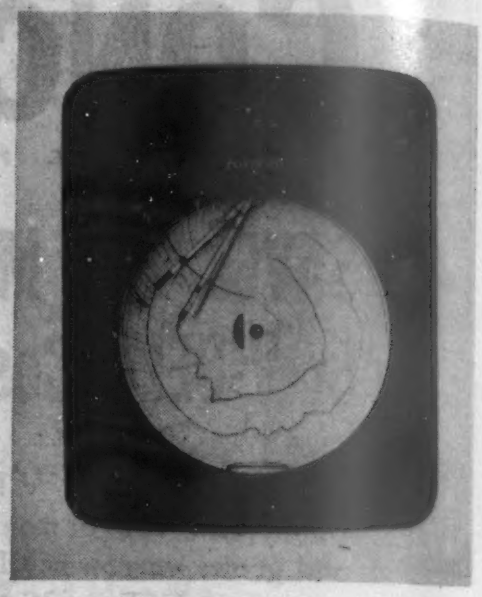
Speed is the money-saving Clark keynote—in storing materials, in getting them out again.

CLARK ELECTRIC AND GAS POWERED FORK TRUCKS AND INDUSTRIAL TOWING TRACTORS

INDUSTRIAL TRUCK DIV., CLARK EQUIPMENT COMPANY BATTLE CREEK 12, MICH.
REPRESENTATIVES IN PRINCIPAL CITIES THROUGHOUT THE WORLD
AUTHORIZED CLARK INDUSTRIAL TRUCK PARTS AND SERVICE STATIONS IN STRATEGIC LOCATIONS

general purpose or watertight enclosures. Allen-Bradley Co., 1311 South 1st St., Milwaukee.

•



Selector Control

Instrument, called Auto-Selector, controls, selectively, from either of two related variables, by positioning a single valve, damper, or other operator. Selection is determined by the variable having the greater tendency to exceed its pre-set limit; manufacturer says the transfer of control is automatic, and that automatic reset may be incorporated in the control of either or both variables. It is not necessary that the controlling measurements be of like variables. Any two that are related may be combined, such as outlet temperature and steam pressure in a heat-exchanger, or temperature and flow of brine in a cooler. Controller is available either as a recorder or indicator. The Foxboro Co., Foxboro, Mass.

•

Flame Failure Safeguards

Controls and flame failure safeguards, called Fireye Systems FF-2 and FF-6, are designed for use on gas-oil conversion burners. FF-2 is used on oil burners which use gas as an alternate fuel. It consists of photo-electric scanner, electronic flame rod, and programming control. When the system is used on oil, the scanner monitors the main oil flame, providing instantaneous shutdown on flame failure. When converted to gas, the electronic rod monitors the continuous gas pilot flame, and the programming control regulates fuel and ignition systems.

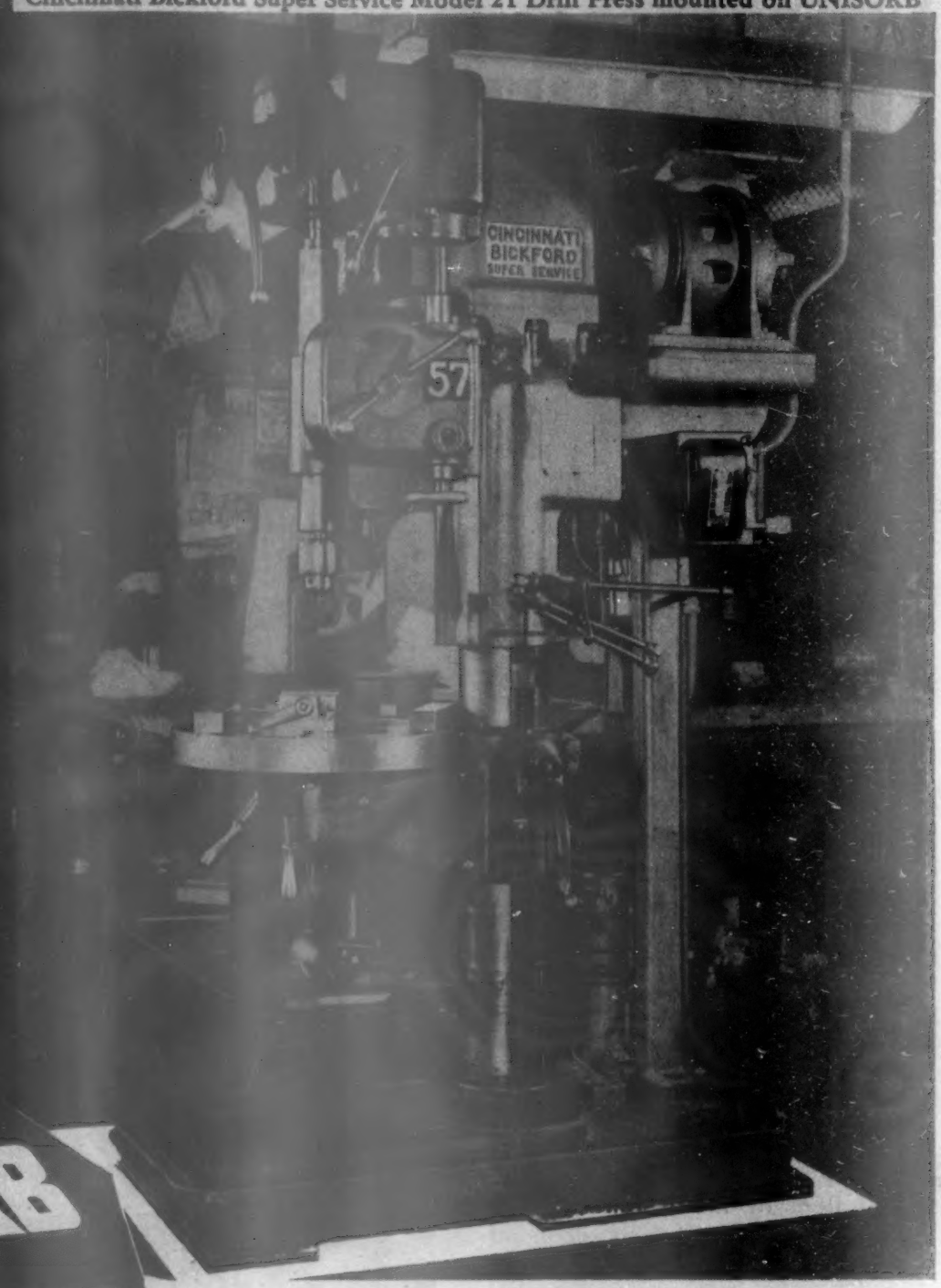
System FF-6 is used on gas burn-

Reduce Vibration...

End Needless Floor Damage

ANCHOR ALL MACHINERY ON UNISORB

Cincinnati Bickford Super Service Model 21 Drill Press mounted on UNISORB



NO BOLTS...NO LAG SCREWS...NO FLOOR DRILLING

UNISORB . . . *the modern way to mount machinery* . . . gives you 3 distinct advantages:

1. ENDS NEEDLESS FLOOR DESTRUCTION—As UNISORB requires no bolts or lag screws, there's no longer any need for destructive floor drilling to anchor machinery. Permanent set prevents riding.

2. SAVES INSTALLATION LABOR COSTS—Installation operations are reduced in number, simplified in method when you "Mount It On UNISORB."

3. REDUCES COSTLY VIBRATION DAMAGE—Because UNISORB absorbs from 60% to 85% of transmitted vibration and noise, it saves floors . . . saves buildings . . . *saves the machinery itself from harmful results of its own transmitted vibration!*

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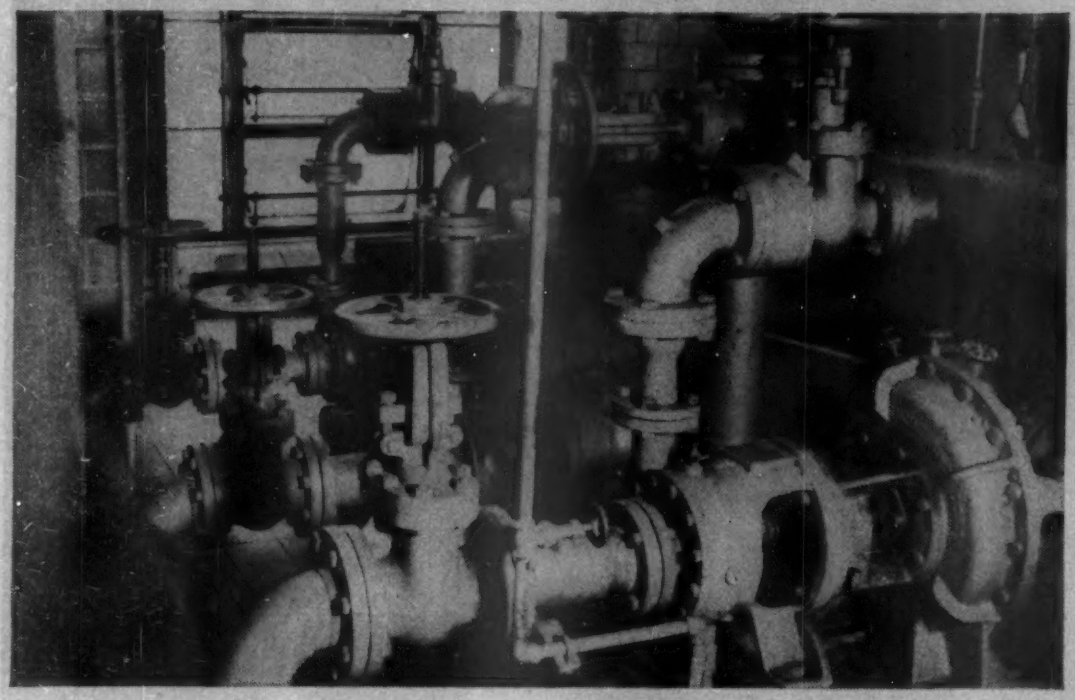
MOUNT YOUR MACHINERY ON UNISORB ANCHORING PADS

More Power to Industry Through **LUNKENHEIMER VALVES**

LUNKENHEIMER VALVES

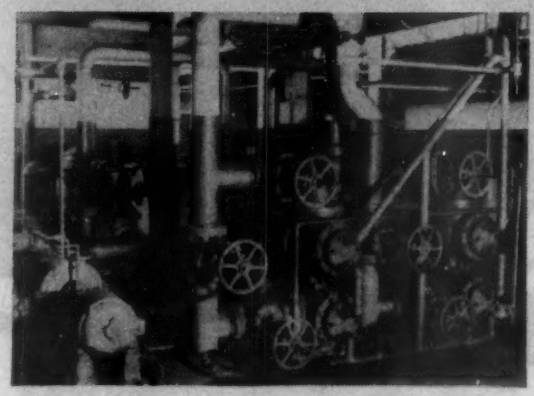
. . . SELECTED FOR NEW SHERWIN-WILLIAMS POWER PLANT

ENGINEERS AND ARCHITECTS: SCHMIDT, GARDEN, AND ERICKSON, CHICAGO

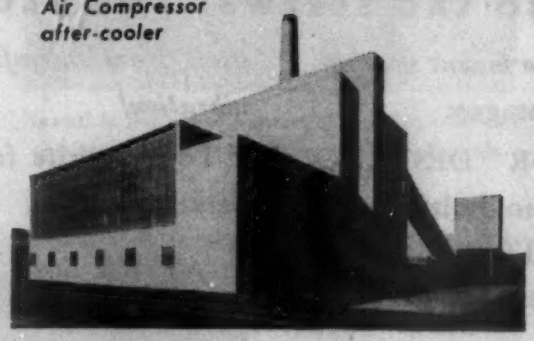


Feedwater treatment transfer pumps

The new power house at Sherwin-Williams' Chicago plant is the last word in efficiency. From the three, 3-drum, bent-tube boilers to the make-up water treatment system, every item of the installation was selected for trouble-free, economical operation. It's only natural therefore, that the list of principal equipment specifies Lunkenheimer Valves.



Air Compressor after-cooler



And so it is in modern plants . . . in a wide cross-section of industry . . . across the country, LUNKENHEIMER VALVES are selected for low-cost operation and dependability. From industrial consultants to operating men, experience with these quality valves proves there is no better valve available.

Whether you're planning a new plant, expansion of present facilities or modernization . . . you can specify Lunkenheimer Valves with utmost confidence. Available through Distributors in all industrial centers.

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LUNKENHEIMER VALVES

BRONZE, IRON, STEEL, AND CORROSION RESISTANT ALLOY VALVES

AIR DEVICES, LUBRICATORS, AIRCRAFT FITTINGS

ers which use light oil as an alternate fuel. It includes electronic rod and control. The electronic rod monitors the continuous gas pilot, providing through the control instantaneous shutdown of main flame on pilot flame failure. Monitoring operations on gas and light oil are identical, and no wiring changes are required on change-over. Combustion Control Corp., 77 Broadway, Cambridge 42, Mass.

•

Solenoid Valve

Four-way solenoid valve is of the balanced spool type, controlled by a built-in pilot valve. Manifold design permits flexibility in piping arrangement, states the manufacturer; lines may be connected to bottom, sides, or a combination of both as required. Three-point mounting pads are provided to prevent distortion of parts.

Adaptable to straight-line piping, with valve capacity equal to rated pipe size, valves and manifolds are interchangeable, and the valve itself may be removed without disconnecting pipelines. Spool and sleeve assembly may be replaced by removing end caps without moving the valve out of position. Solenoids may also be removed and replaced without severing wiring connections if a cord with pin plugs is used. Hanna Engineering Corp., 1765 Elston Ave., Chicago 22.

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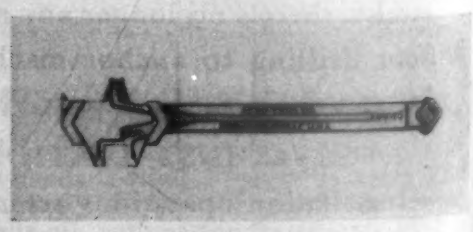

Universal Wrench

Cast steel wrench, No. 5001, has sockets and lugs designed to fit all standard steel drum closures, and steel lip for removing steel caps over drum closures. According to manufacturer, wrench will fit male, female, and hexagon-drive closures as well as closures driven by internal lugs. Cadmium plated to resist corrosion and prevent sparking. Over-

all length, 15½ inches; weight, 2½ pounds. Aero Tool Co., 6930 Avalon Blvd., Los Angeles 3.

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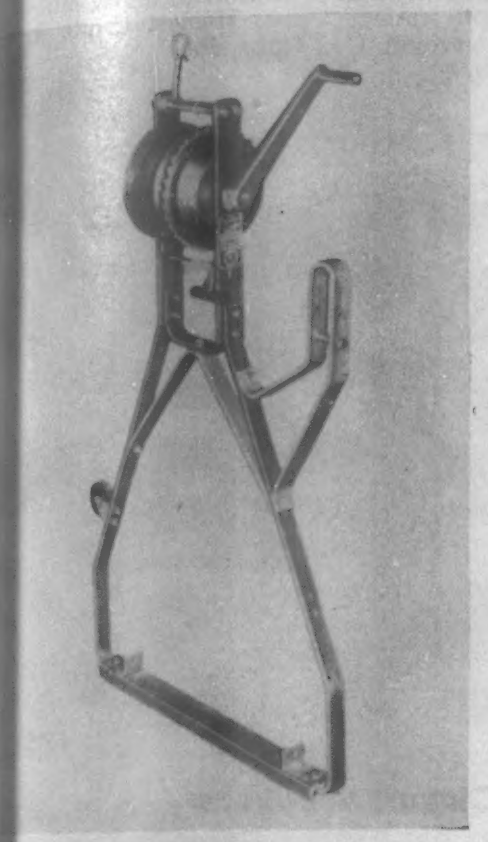

Winch for Swinging Scaffolds

Aluminum winch and stirrup unit, called Saf-T-Swing, is for use on swinging scaffolds. Complete stage includes two winches, each with attached stirrup and 150 feet of steel cable, guard rail, and center post. Platforms up to 2½x20 feet in size may be used. Will handle loading up to 25 pounds per square inch, with rated capacity of 625 pounds per winch. By removing four bolts, the winch may be detached from the stirrup to be used for other hoisting purposes, such as bos'n's chairs. Two-way crank operation permits raising or lowering the platform at a rate of 20 feet per minute, according to manufacturer. Cable can be pulled from the drum by hand, to speed rigging time, and to allow inspection of the cable. Safeway Steel Products, Inc., Milwaukee 13, Wis.

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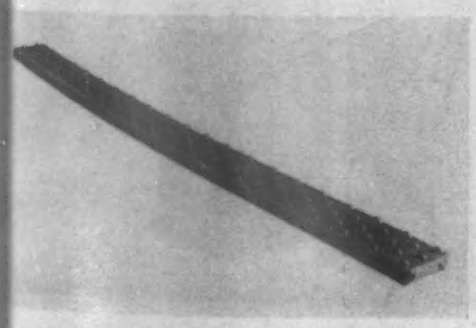

Skate Wheel Conveyor

Lighweight portability is claimed for the Gee-Vee-Line skate wheel conveyor, each 10-ft. section of which weighs 28 pounds. Constructed of heavy-gage aluminum with channel

How carton assembly costs were cut 50%

Acme Silverstitch helps fixture manufacturer make stronger carton in half the time

They wanted a stronger carton assembled at less cost.

So Duro Test Corporation called the Stitching Division of Acme Steel Company.

Working with members of their shipping department, the Acme expert helped install a production-line packaging system built around an Acme Silverstitcher.

Now the Duro Test Corporation, North Bergen, New Jersey, packs its fluorescent fixtures in a stronger box in half the time, and saves 50% of previous labor cost. The finished package is a neater, better-looking job—for greater customer satisfaction.

Why not ask an Acme Shipping Specialist to look over your shipping and packaging problems? You won't be obligated, and savings are often substantial. Mail the coupon today for detailed information on what the Acme Silverstitcher can do for you.

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ACME SILVERSTITCHER makes a neater, stronger carton at a saving of 50% in labor cost.

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AND SILVERSTITCH BOX-STITCHING WIRE

30% Savings thru Simplified Control of Production, W-I-P, Costs, Payroll and Materials

Savings thru "McCaskey Simplification" are again demonstrated—this time by twenty-five years of service in the plant of Mathias Klein and Sons, Chicago, Ill.

Their McCaskey System provides control of work-in-process by operations, perpetual inventory of raw materials and sub-assemblies, payroll records and distributions and operation costs. The status and progress of hundreds of jobs involving from three to fifty operations each are constantly available at a glance.

About eight months after the system was originally installed, Mr. J. A. Klein, Jr., then Superintendent and now President, commented that their McCaskey System had reduced time and clerical work 30%, provided control that was more accurate than the posted records replaced and made available complete monthly analyses approximately two weeks earlier than before.

What was true then is true today, and their requirements have increased both in size and the complexity that results from present operating conditions. Changes in detail have been made to meet the expanded needs of the organization, but the basic principles of "One-Writing and Visible-Filing" have not been altered.

McCaskey Controls and multiple-copy forms are used in hundreds of plants to simplify procedures and provide prompt, accurate data. Write for a demonstration and suggested applications to your requirements—or descriptive folders. No obligation.

McCaskey INDUSTRIAL CONTROLS

PRODUCTION • INVENTORY • TOOLS • COSTS • PAYROLL

THE McCASKEY REGISTER COMPANY, ALLIANCE, OHIO

McCaskey Systems Ltd., Galt, Canada — The McCaskey Register Co., Watford, England

section sides, aluminum skate wheels with hardened-steel ball-bearing races. Handles moving loads of 150 pounds on horizontal or incline. End-to-end connectors are built into each section to allow multiple unit set-ups, Haslett Chute & Conveyor Co., Oaks, Pa.

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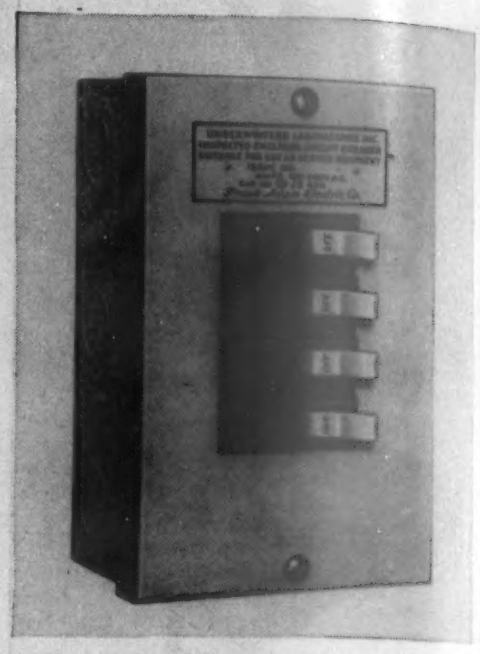


Circuit Breakers

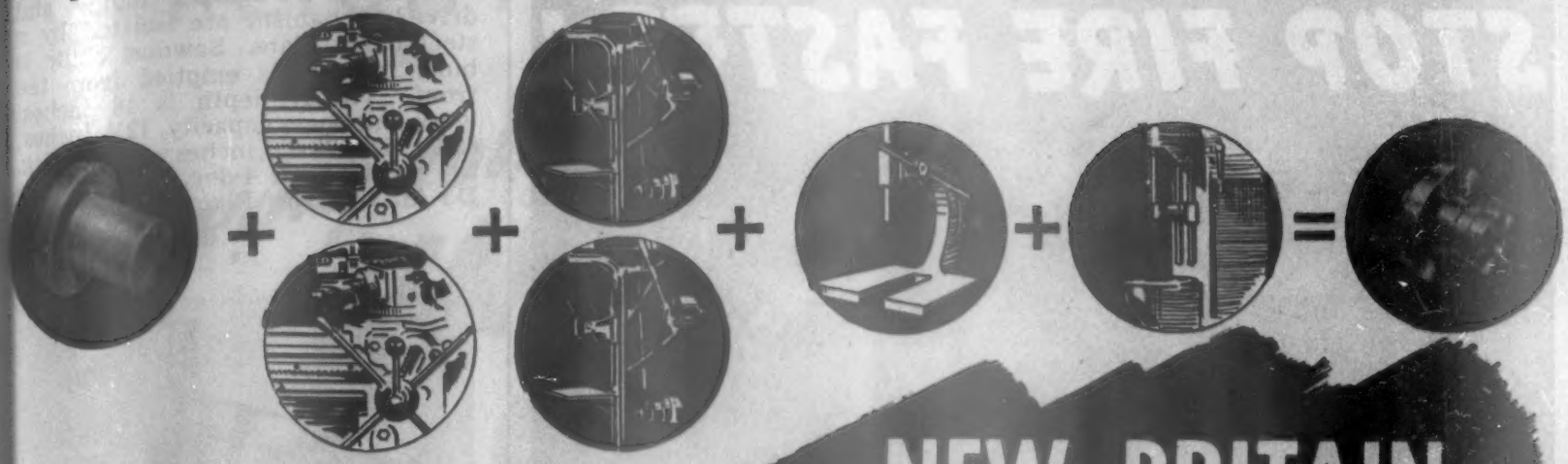
Enclosed branch circuit a.c. circuit breakers are available for flush and surface mounting. Manufacturer states that they have ample wiring space and conveniently located knockouts. Breakers are mounted with independent screws to facilitate removal or capacity changes. Entire assembly and mounting bracket may be removed to simplify wiring. Suitable for controlling lighting in small areas, or for controlling small motors on machinery of which the motor is a part. Frank Adam Electric Co., 3650 Windsor Pl., St. Louis, Mo.

•

Convertible Bandsaws

Line of convertible bandsaws range from a single speed woodworking saw to a machine with double range variable speed control and equipped for sawing, filing, and polishing operations. Pressed-steel shell encloses

If you are doing this . . .



put the whole job on

NEW BRITAIN AUTOMATIC

In many plants, this sort of operation has been going on for years . . . on the theory that the run was too short for an automatic . . . or because "It couldn't be done economically on an automatic."

The squeeze between manufacturing costs and selling prices has prompted many a company to take a considered "second look" at such operations. As a result, a wide variety of pieces are now being completely machined on New Britain automatics, with important economies in manpower, machines, floor space and cost per piece . . . together with improved quality of work.

These features help cut cost per piece on NEW BRITAIN CHUCKERS

- *Double Indexing* of spindle carrier with loading in two positions can be provided to complete both ends of a piece on a single machine.
- *Spindles May Be Stopped* to permit accurate alignment of part for many secondary operations.
- *Open End Construction* reduces setup time and makes tool adjustment easy.
- *Variable Chucking Pressures* in last positions prevent distortion of thin-walled or fragile pieces.

The piece sketched illustrates many typical second operations which New Britains can eliminate. Get the facts and figures on actual jobs. Send for the free folio "Cost Histories". It may suggest a solution to multiple operations which are bottlenecking your production.

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Ansul Dry Chemical Fire Extinguishers give you more protection... pound for pound... dollar for dollar... than any other extinguisher of comparable size.

In addition... Ansul Fire Extinguishers provide the best first-aid protection:

- For paint spraying and dipping operations.
- For hazards involving alcohols, solvents, gasoline, oils, asphalts and greases.
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Ansul Fire Extinguishers have the highest ratings for effectiveness on flammable liquid fires, based on tests conducted by nationally recognized approval agencies. The longer range stream of dry chemical is effective in winds and drafts.

After use, Ansul Dry Chemical Fire Extinguishers can be recharged "on the spot"... providing continuing protection... and annual recharging of Ansul extinguishers is *NOT* necessary.

Safe to use... non-toxic, non-corrosive, non-abrasive.

Ask for your copy of file No. 213.. You will receive factual data on how Ansul Dry Chemical Fire Extinguishers will cut your fire protection costs.

Listed and approved by Underwriters' Laboratories and Factory Mutual Laboratories.

ANSUL CHEMICAL COMPANY
FIRE EXTINGUISHER DIVISION, MARINETTE, WISCONSIN
DISTRIBUTORS IN ALL PRINCIPAL CITIES

all working parts. Frame is arc-welded over die forms and is integral with shell structure. Motor and drive mechanism are isolated by a steel baffle plate. Sawdust chute is built in, and is emptied from the front. Throat depth is 16 inches; work thickness capacity, 12⅛ inches; table size, 20x20 inches with a 45-deg. tilt right and a 4-deg. tilt left. The Do-All Co., Des Plains, Ill.

•

Fork Truck

For moving materials through narrow doors and aisles and in cramped quarters, gas-powered fork truck has single hydraulic lift-and-tilt control lever which raises or lowers forks and tilts load forward or back in any combination of simultaneous movements required. Said to have 2000-lb. capacity at 24 inches from heel of fork. Inside radius is 6 inches; outside, 67 inches. Maximum fork height with 5-ft. mast is 84 inches; with 7-ft. mast, 108 inches. Mast has 5-deg. tilt forward and 10-deg. tilt back. Forks are adjustable from 9 to 26 inches. Tract-R-Lift Corp., 605 North Aberdeen St., Chicago.

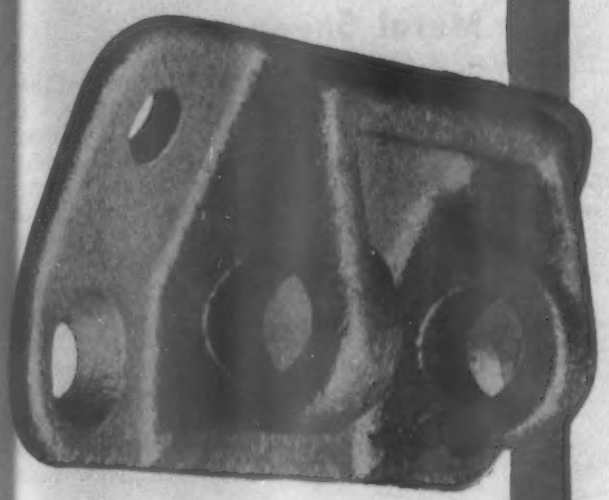
•

Flow Indicator Alarm

Electric alarm system, using either light or sound, is automatically actuated when the high or low limits of flow indicator are reached. System consists of selectivity controls, microswitch, electric alarm connections.

FREIGHT CAR BUILDERS

..swing toward UNITCASTINGS!



★ ★ "down the middle" accuracy!

The nation's railroads have vast experience in car design and know that dependable cast steel units simplify construction and afford many plausible gains toward a speedier, less costly car building program.

The hinge butt is an excellent example of the importance of a cast steel unit used by the railroads. Made in one piece . . . all sections are knit properly to one another and the job is complete within itself. Nothing to put together—nothing to come apart! No jigs or fixtures are necessary and no drilling or prefabrication is required to waste time. The metal is placed where necessary to gain strength and reduce weight.

Regardless of your line of manufacture, Unitcast can recommend and produce dependable cast steel units that will do *your* job *right!*

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Write or call today!

UNITCAST CORPORATION

STEEL CASTING DIVISION • TOLEDO 9, OHIO

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A DOOR IS ONLY AS GOOD AS IT OPERATES

SEE OUR CATALOG IN SWEET'S

What you want most in a door is easy, dependable operation—all day, every day—to keep traffic flowing in and out and merchandise on the move.

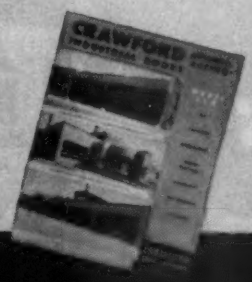
You want a door that spends a minimum of time waiting for the service man to arrive so it can get going again. Nothing's more useless than a door that isn't working! And, for that reason, you want a door that's backed by dependable service, day and night, week-ends and holidays, too.

For nearly 20 years Crawford dealers have been building business on that kind of door and that kind of service. All our dealers specialize in service on *any* make of door and many carry stocks of the most frequently needed replacement parts.

Next time your doors, regardless of make, need service, call the Crawford man listed under CRAWFORD DOOR SALES CO. in the Yellow Pages of your phone book. He'll get on the job—fast!

He'll be glad to tell you, too, about Crawford Doors, power operators, remote controls, and the energized "MARVEL-LIFT" which operates so easily that Crawford Doors up to 14′ x 14′ can be operated by hand.

A pleasure to send you literature on request.



Crawford DOOR CO.

409 St. Jean • Detroit 14, Michigan

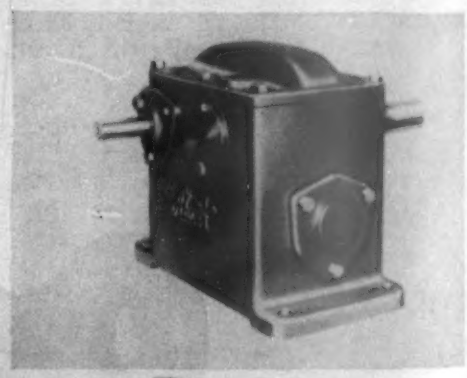
and dial which shows rate of flow at all times. Control pointers are set at the desired maximum and minimum rates of flow and locked with a knob. Alarm may be set to operate when flow exceeds the limits by a fraction of a gallon per minute, or on wide range limits. Henszey Co., Watertown, Wis.

•

Metal Shear

Small head and base on shearing machine, called The Grampus, is claimed to take material of almost any shape over the head or under the base for fast, burr-free cutting. Locking device secures work for inside cutting, both straight and contour, for which no starting hole is required. Rated up to and including 14-gage mild steel it will handle work of various diameters and depths within the limits of its 7-in. throat. Unit weighs 100 pounds including ¼-hp. motor. Direct coupling drive eliminates belts. Federal Machinery Co., 134 Grand St., New York.

•

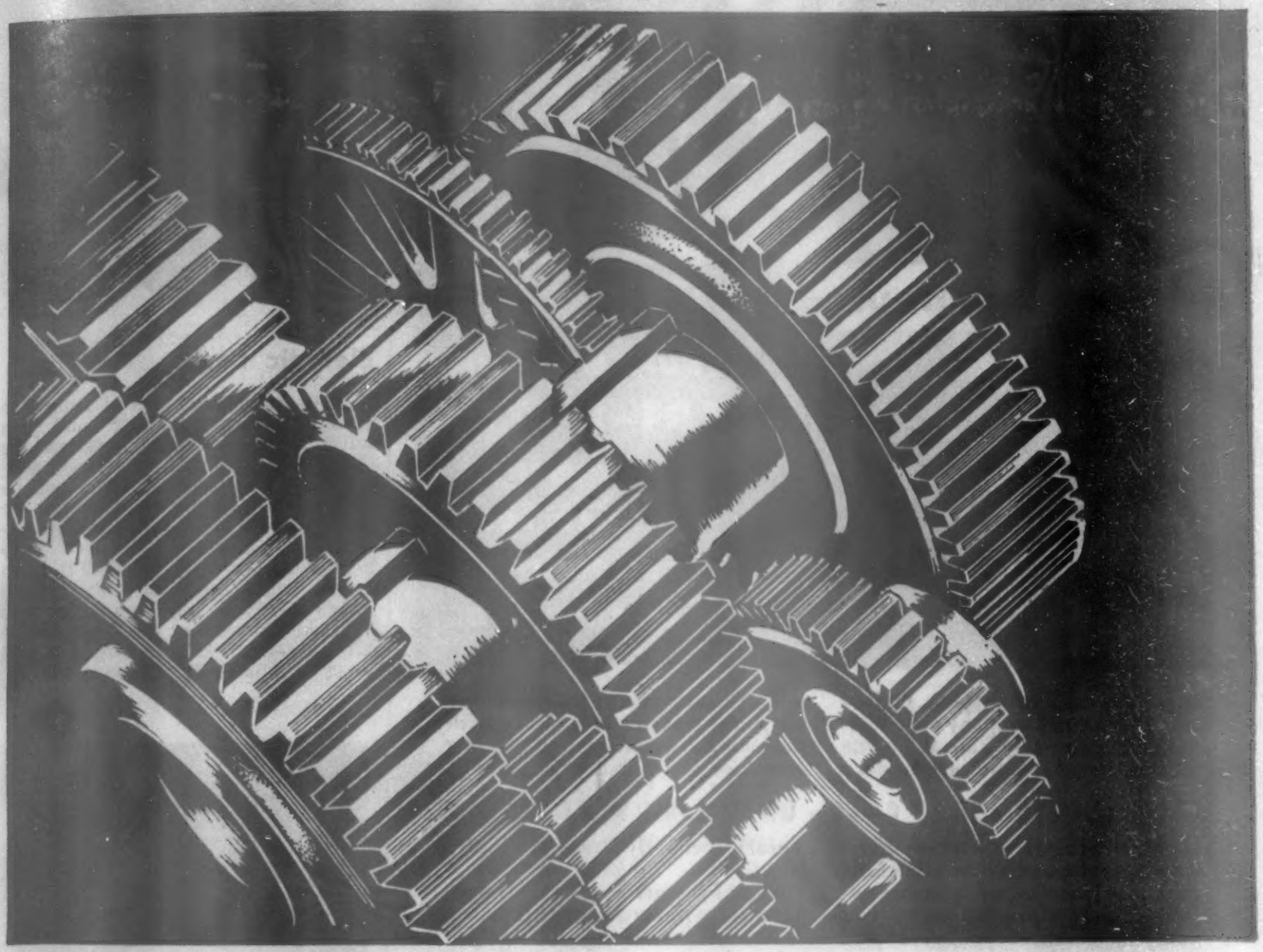


Double Reduction Speed Reducers

Known as the DW series, line of double reduction worm gear reducers has nickel bronze worm wheels, case-hardened and ground alloy steel worms integral with shafts, high-speed and intermediate shafts of alloy steel, mounted on ball bearings, bronze bearings on slow speed shaft. Input and output shafts can project on either or both sides. Shafts may operate in either direction. In Type DWU the output shaft is up, with input shaft projecting on either or both sides.

Housing is of rigid semi-steel, dust-proof and oil tight. Cover can be removed for inspection of worm and wheels without disturbing alignment. Type 300 has a torque rating of 2500 inch-pounds; Type 225-DW, 1000 inch-pounds. Type 150-DWP is

YES! Tycol "Engineered Lubrication" performs better . . . BETTER . . . BETTER



Tycol Engineered Lubrication performs better because:

. . . *Tycol Engineered Lubrication* supplies the scientific answer to every lubricating need in industry—from spindle oils for textile plants to roll neck greases for steel mills.

. . . *Tycol Engineered Lubrication* boosts production by promoting efficient, smoother-running machine operation . . . there's a Tycol oil or grease "engineered" for your specific job.

. . . *Tycol Engineered Lubrication* slashes costs by prolonging equipment life, protecting it against wear and tear . . . repair bills and "down time" are invariably reduced.

Let Tide Water Associated help you select the best lubricant for your particular need. Write, wire or phone today to your nearest Tide Water Associated Office for full details.

TYCOL
INDUSTRIAL LUBRICANTS

Boston • Charlotte, N. C.
Pittsburgh • Philadelphia
Chicago • Detroit • Tulsa
Cleveland • San Francisco

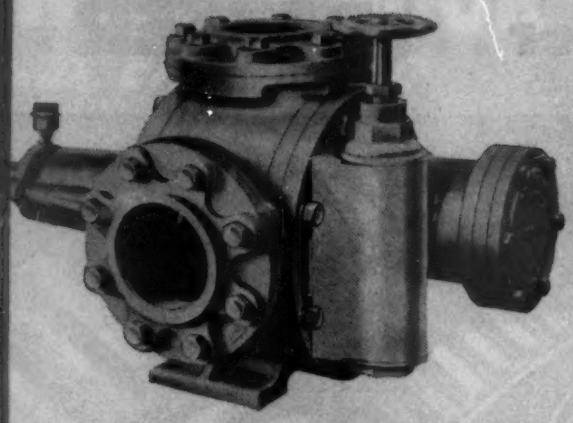
TIDE WATER ASSOCIATED OIL COMPANY
17 BATTERY PLACE · NEW YORK 4, N. Y.

LUBRICATION — "ENGINEERED TO FIT THE JOB"

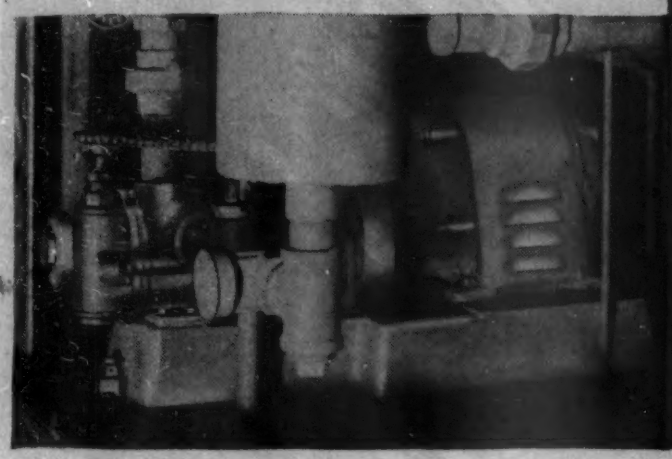
Here's Another User

UNITED STATES GYPSUM COMPANY

Here's the Pump



Here it is in use



and here's why

Yale & Towne TRI-ROTOR is Industry's choice for so many pumping jobs

In its plant at Philadelphia, United States Gypsum Company uses TRI-ROTOR pumps by Yale & Towne because these are the *only* modern low-pressure pumps that combine the *power economy* of a rotary with the *positive handling* and *product protection* of a piston type pump.

LOW MAINTENANCE COST—ONLY 3 MOVING PARTS

Handles wide variety of liquids—volatile to viscous. No over-heating, chewing, foaming, or agitating.

With only 3 moving parts (two pumping members) you are assured of low maintenance cost.

Optional and interchangeable; Variable Volume Control (with or without Manual Flow Control), Integral Relief or By-Pass Valve, Solid Head.

New: Pressure Regulator Device permits operator to adjust hydraulic mechanism to control both volumetric capacity and discharge pressure without stopping the unit.

Sizes: 5 to 200 gpm for a wide variety of industrial applications.

ECONOMICAL—*Rotary Action*... PROTECTIVE—*Piston Action*... ONLY YALE GIVES YOU BOTH IN ONE PUMP

Wire or mail your requirements to Pump Department,

THE YALE & TOWNE MFG. CO., 212 Henry St., Stamford, Conn., U. S. A.

The Yale & Towne TRI-ROTOR Pump is now in use pumping such products as these (check applications which interest you)

☐ Alcohol	☐ Fish Oil	☐ Lacquer	☐ Shortening
☐ Caustics	☐ Gasoline	☐ Liquid Soap	☐ Silicate of Soda
☐ Chocolate	☐ Glucose	☐ Molasses	☐ Solvents
☐ Coolants	☐ Greases	☐ Oils	☐ Starch
☐ Corn Syrup	☐ Ink	☐ Paint	☐ Varnish
☐ Edible Oils	☐ Honey	☐ Propane	☐ Viscose

NAME.....

COMPANY.....

CITY..... Zone State

TRADE YALE MARK

Pump Department of
THE YALE & TOWNE MFG. CO.
Stamford, Conn., U. S. A.
Representatives in Major Cities

Makers of the Famous Lines of Locks, Hardware, Hoists and Industrial Trucks

designed for use on small work. Abart Gear & Machine Co., 4834 West 16th St., Chicago 50.

•

Electric Lamp

Said to have a service of from 3 to 5 years, portable electric hand lamp with built-in charger, called Big Beam No. 312, has leak-proof acid-resistant plastic case. Three-ball indicator shows amount of charge; 18-gage, welded steel case contains battery and charger. Six-inch lamp head has main bulb for 2000 ft. beam and a small bulb for dim, diffused light. Swivel adjustment permits vertical movement of head within 170 degrees. U-C Lite Mfg. Co., 1051 West Hubbard St., Chicago 22.

•

Electric Hand Drier

Manufacturer states that electric hand drier, called Airtowel, provides hot air which dries wet hands in approximately 40 seconds. Blower is

No matter

what kind of records you keep or how many...

They'll cost you less on **UARCO** *business forms*

***For instance** . . . this E-Z-Out Form is one of the many types with which Uarco serves every kind, every size of business. With E-Z-Outs, one writing produces every copy the job requires. No carbon mess . . . carbons come already interleaved. Copies are held together neatly for additions or corrections—then detached with one simple operation.*

Perhaps it's an invoice, a cash sale form, a work order, a receiving ticket. Maybe you write a thousand forms a day—a week—or a month.

No matter what kind or how many, they still must be produced . . . copied . . . distributed . . . filed. And there's where Uarco business forms save you money! They cut the time for each operation to an absolute minimum. And at today's wages, *time* is certainly *money!*

Give your people a chance to serve you more effectively. Call in a Uarco Representative for a complete survey of your business form requirements. There is no charge for this service—no obligation whatever.

UARCO INCORPORATED
Chicago, Ill.; Cleveland, O.; Oakland, Cal.; Deep River, Conn.
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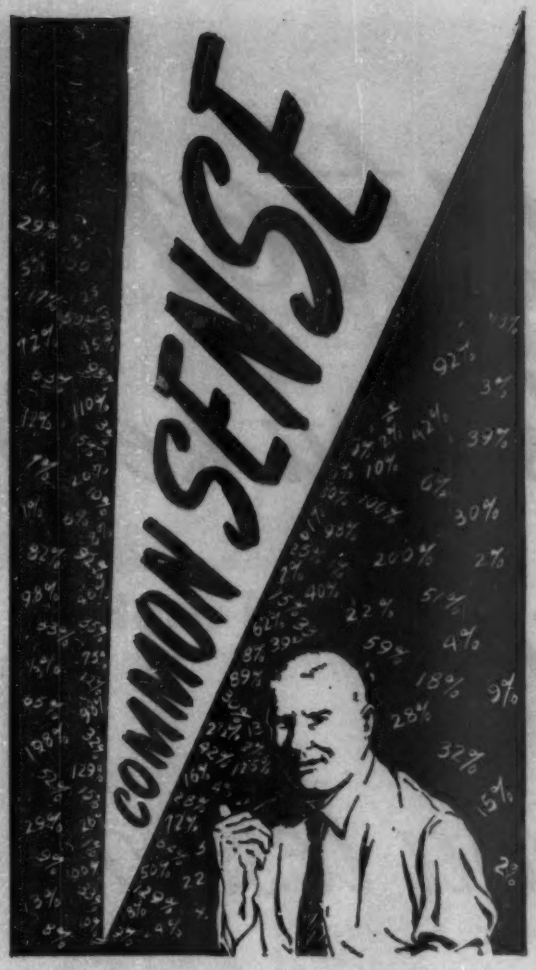
UARCO INCORPORATED *Business Forms*

CONTINUOUS-STRIP FORMS FOR TYPEWRITTEN AND BUSINESS MACHINE RECORDS

SINGLE SET FORMS

AUTOGRAPHIC REGISTERS AND REGISTER FORMS



COMMON SENSE in the shop would seem to call for careful cutting fluid application, because oil that improves one operation may not be right for something different. *There just isn't any "one shot" cutting fluid that can do a large percentage of all jobs!* Consider all the variables—the wide variety of speeds, feeds, materials, tolerance and finish requirements encountered in machining operations in one shop. Those are the considerations that make it economical in the long run to be sure the cutting fluid you use is scientifically correct. "On-the-job" tests help you determine what cutting oil qualities are needed, and may even result in a decrease in the number of oils now used. It is plain common sense to call in cutting oil experts . . . people with a sound background of practical experience who can be relied upon to recommend the right cutting fluid for the job.

—Chip

SOLVOL

water mixed cutting compound

Solvol is more than just a high grade, emulsifiable cutting fluid. It is a unique super soluble product with the extra metal cutting qualities that will solve some of your machinery problems and help eliminate production headaches. Ask for literature.

Another Time-Tested Stuart Product

STUART *service goes with every barrel*

D. A. Stuart Oil CO.

2727-31 SOUTH TROY STREET, CHICAGO 23, ILL.

operated by means of a foot switch, mounted on a heavy steel platform, which actuates a universal motor with self-oiling bearings. Morici Products Corp., 835 W. Madison St., Chicago 7.

•

Drafting Machine

Designed for operation in any position from true horizontal to true vertical, stainless steel drafting machine is manufactured for boards 24, 30, 36, 42, 48, 54, 60, 72, 84, 96, 108, 120, and 132 inches wide by any length. Special machines, including left-handed ones, can be furnished for odd-size boards. Minute adjusting screw on the micromatic quadrant allows indexing of angles to every 3 degrees, and permits adjustments as fine as 2½ minutes, according to manufacturer. Emmert Mfg. Co., Waynesboro, Pa.

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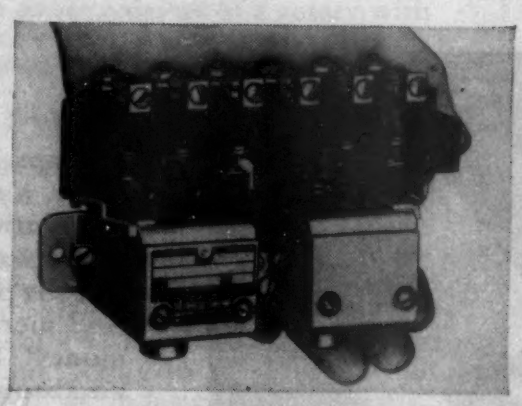


Reversing Contactor

Designed to control small a.c. and d.c. motors, reversing contactor has double break, silver-to-silver contacts which may be removed by pressing down, turning, and lifting out. Yokes and contact block are of melamine. Suitable for use with a.c. polyphase motors rated not more than 1 horsepower, and with a.c. single phase and d.c. motors not more than ¾ horsepower. Square D Co., Industrial Controller Div., 4041 North Richards St., Milwaukee 12.

•

Aluminum Paint for Hot Surfaces

Ready-mixed protective coating, called Permite Special Exterior Heat-Resisting Aluminum Paint No. 1901, was developed for use on outdoor boilers, steam pipes, smoke stacks, manifolds, engine heads, and similar

FOR SAFETY PLUS

For *better* rubberized Work Gloves, look for the HOOD Trade Mark — a sign of quality since 1896. Styles to suit every requirement. Send for folder. Order from your jobber.

HOOD

HOOD RUBBER CO., WATERTOWN, MASS.
A Division of the B. F. Goodrich Company

MATERIALS-HANDLING EQUIPMENT THAT SPEEDS WORK, CUTS COSTS

No other Mobile Crane of this type has all the features of *KRANE KAR*. You get more speed, more work, more safety. Loads and Unloads freight cars, trucks, trailers—Stacks and Stores—expedites Plant Maintenance.

KRANE KAR handles loads of any shape or size within rated capacity. Works in tight quarters, low headroom, up and down ramps . . . anywhere, in plant or yard. Often cuts handling costs to 8¢ a ton.

Self-Stabilizing: dangerous use of jacks or stabilizers eliminated. *Automatic Power Cut-Off* at extreme positions of Boom-Swing or Topping. *Automatic Braking* of Load and Boom Lines. *No Tail-Swing:* no part of Crane passes over operator's head.

Gas or Diesel. 9 to 37 ft. booms or adjustable telescopic booms; electric magnet, clamshell bucket, and other accessories available.

ASK FOR ILLUSTRATED BULLETIN #79.

USERS: General Motors; Bethlehem Steel; Todd Shipyards; Boeing; General Electric; duPont; Pullman Standard; etc.

THE ORIGINAL SWING BOOM MOBILE CRANE WITH FRONT-WHEEL DRIVE AND REAR-WHEEL STEER

2½, 5, AND 10 TON CAPACITIES

KRANE KAR

TRADE MARK REGISTERED

SILENT HOIST & CRANE CO.
855 63rd ST., BROOKLYN 20, NEW YORK

Conomatic Progress Reporter

the Cone Reporter notes that—

American Bosch Corp. has a diesel injection pump in which a single plunger and valve do the work of four or six.

Progress with Conomatics

Trouble free, profitable Conomatics are easy on your muscles and easy on your nerves. Take a holiday from worry with a Conomatic on the job.

Conomatics for *Pro*gress

W. G. Bickley of Imperial College, London, offers a new series of number symbols to speed the work of electronic computing machines.

Progress with Conomatics

Buffalo Niagara Electric has a new 150,000 horsepower transformer that is said to be the largest in the country.

Conomatics for *Pro*gress

Continental Die Casting Corp. of Detroit has found a way to combine gold and chrome plating on a single piece of metal.

Progress with Conomatics

Glenn L. Martin Co. has developed the airplane hydraulic brake for automobile use.

A new searchlight for Coast Guard cutters projects 32 million candlepower from a 900 watt mercury light source that is no bigger than a kitchen match.

Conomatics for *Pro*gress

The Custer channel wing plane has been successfully flight-tested and is to be made by National Aircraft Corp., Hagerstown, Md.

Progress with Conomatics

A new movie screen that is a section of a sphere and can be made to fill half the wall space of a theater has been patented. The rights have been assigned to Vitarama Corp.

Conomatics for *Pro*gress

Toledo Scale Co. has a new line of computing scales adapted to the present day price ranges of groceries.

Progress with Conomatics

Heil Co. of Milwaukee has a new dump truck with 18½ cu. yds. capacity.

LeTourneau's new bulldozer, said to be the world's largest, weighs 93,000 pounds, has a 750 h.p. engine, and seven-foot tires.

Conomatics for *Pro*gress

This winter bus operators may have a heater made by Petroleum Heat & Power Co. of Stamford, Conn., that will keep cooling water from freezing at night, pre-heat the engine and warm the interior.

Progress with Conomatics

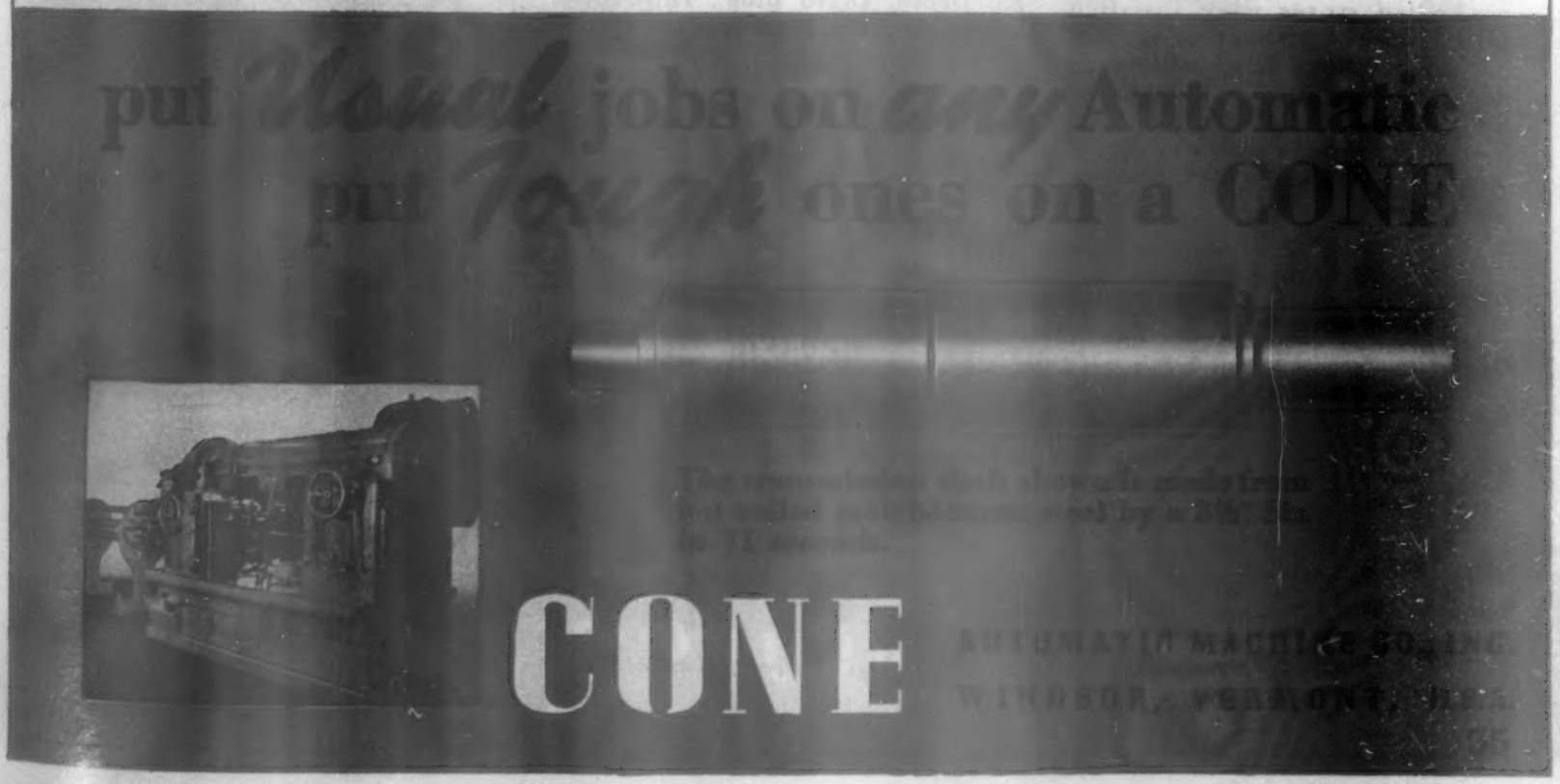
The Conomatic frame construction is one reason why Conomatics operate at lower cost. The frame was not "inherited", it was designed. The short, well proportioned, upright frame members give better support to the tooling area than do taller, less rugged upright members of competitive machines.

Conomatics for *Pro*gress

The world's most powerful electrostatic accelerator will be constructed for the Los Alamos Scientific Laboratory of the University of California.

Progress with Conomatics

Minnesota Mining & Mfg. Co. has a new tape of adhesive that is said to bond metals, fiber, wood or plastics with a sheer strength up to 3,500 p. s. i.



---on cutting fuel bills in Half

During New England's severe winter of 1947-8, the J. C. Corrigan Company, Inc., of Dorchester, Mass., *cut its fuel bill nearly 50%* by installing a DRAVO *Counterflo* Heater. Coal for the previous winter season had cost this company between $1100.00 and $1200.00, whereas only $652.00 was spent for oil to fuel the DRAVO Heater during a similar period.

Besides fuel savings, the maintenance expense for the old heating system was practically eliminated because the DRAVO Heater operates automatically by thermostatic control. "Even more important" says J. C. Corrigan, President, ". . . part of our substantial increase in production this winter was due to the improved heating system."

Employees in the Corrigan plant manufacture custom-built conveying systems and need adequate warmth for efficient fitting and assembling. Previously, the plant was heated by a coal burning furnace using blowers and ductwork to distribute the warm air. Excessive roof heat losses in this 165' x 70' x 27' building prevented it from being comfortable. To heat "cold spots" that developed, eight pot-bellied stoves were installed. Maintenance of this old heating method required three hours labor every day. Coal and ashes had to be hauled through the heart of the busy plant. Even with the eight stoves to supplement the coal-fired furnace, heat was inadequate and employees spent valuable production time huddling around the stoves.

In November 1947, one DRAVO *Counterflo* Heater with an output capacity of 2,000,000 Btu was installed. No ductwork was needed. Only fuel and power lines had to be connected and a vent stack installed. Now the entire factory area is maintained at the proper degree of warmth for workers' comfort and efficient production.

During sub-zero weather last winter, the single DRAVO Heater delivered enough heat within 20 minutes after it was turned on to satisfy the thermostat's setting. Moreover, the DRAVO Heater is shut down to conserve fuel during non-working hours, whereas the coal furnace had to be fed over week-ends while the plant was not in operation to maintain some warmth for the Monday morning shift.

DRAVO *Counterflo* Heaters burn oil, gas or coal. Units burning non-solid fuels can be converted from one fuel to another very readily. Coal-fired heaters can be converted for burning gas or oil.

DRAVO CORPORATION, *Heating Section,* Dravo Bldg., Fifth and Liberty Avenues, Pittsburgh 22, Pa.

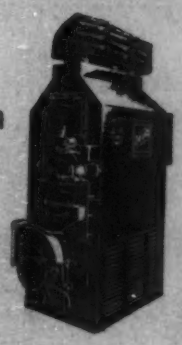
★

DRAVO CORPORATION

Pittsburgh • Cleveland • Philadelphia • Detroit • New York • Chicago • Atlanta • Boston

Sales Representatives in Principal Cities

5 Function Heating with just ONE UNIT



DRAVO CORPORATION, Heating Section, Room 812-10
Dravo Bldg., Fifth and Liberty Avenues, Pittsburgh 22, Pa.

We would like to consider DRAVO *Counterflo* Heaters for:

Name..... ☐ Comfort Heating

Title..... ☐ Year 'round Ventilating

Company..... ☐ Process Drying

Address..... ☐ Tempering Make-up Air

City and State..... ☐ Heat Curing

P-6374

equipment. Manufacturer states that it will resist heat up to 1000 deg. F. and will not blister or peel off when rain hits the hot surfaces. Aluminum Industries, Inc., Permite Paint Div., 2438 Beekman St., Cincinnati 25, Ohio.

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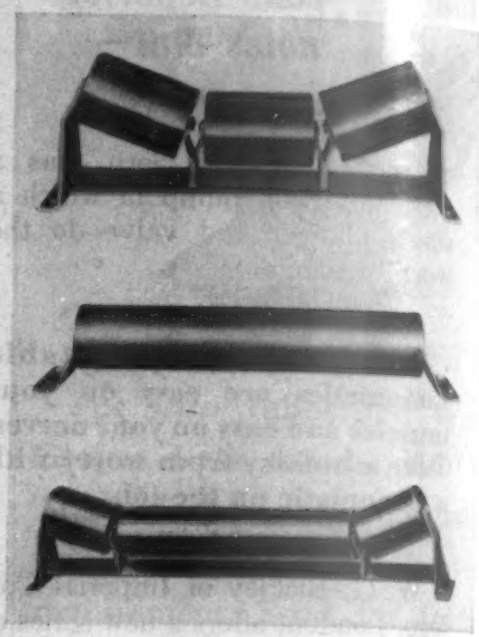

Belt Idlers

Conveyor belt idlers, designed for use wherever conveyor movement of bulk materials is necessary, have idler rolls that are identical for each width of belt. They are removable by hand, and interchangeable. Bearings are "lubricated for life," according to manufacturer, who says that downtime caused by improper greasing or abrasives in the bearings is thus eliminated. Palmer-Lee Co., 1726 Poland, Detroit 12.

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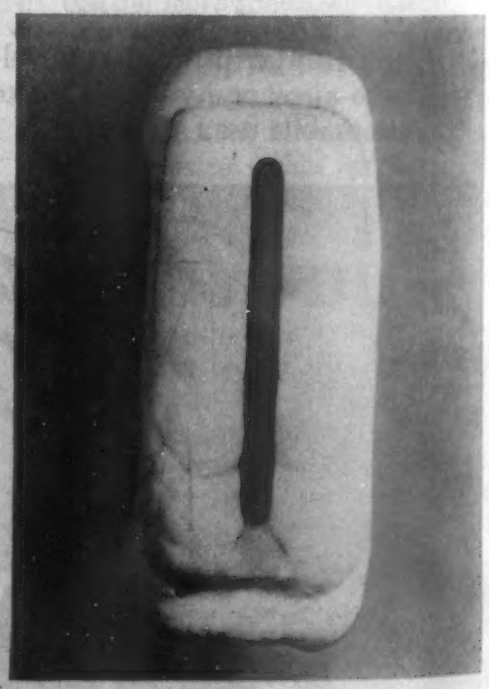


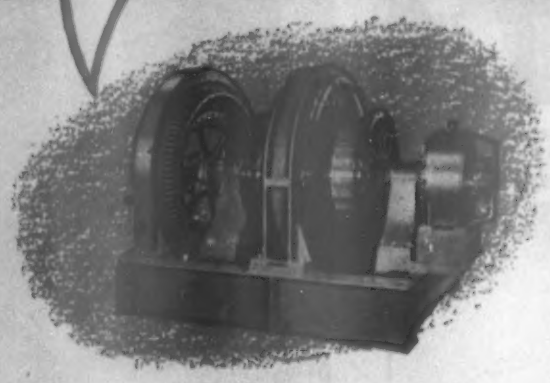
Non-Frosting Gages

Flat glass non-frosting gages are suitable for use in refineries, recycling plants, and other locations where low-temperature fluids must be gaged. They may be made of any material to meet operating conditions. Built with transparent frost-

SPECIALIZATION MEANS PROVED PERFORMANCE

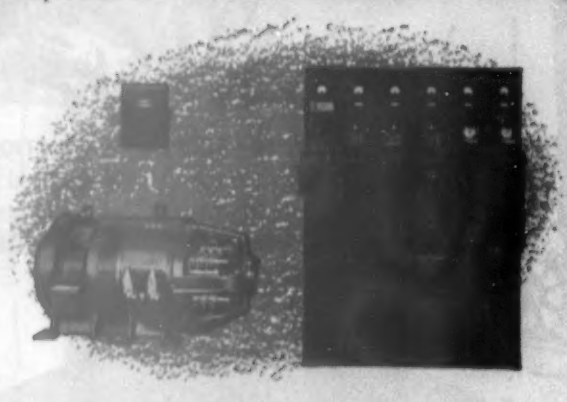
● For 35 years, The Electric Products Company has specialized in the manufacture of High-Current, Low-Voltage Motor-Generators and other special electrical equipment. The result is Proved Performance . . . an assurance of lower-cost operation, higher operating efficiency and more dependable life-time service. For every application, E.P. designs and builds equipment that fits exactly the requirements of the particular operation.

FOR EXAMPLE:



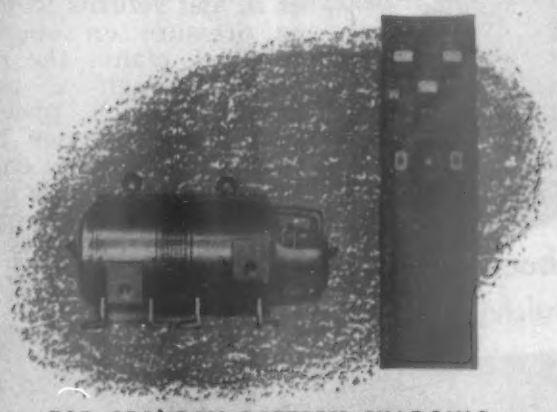
FOR ELECTROLYTIC PROCESSES

E.P. Electrolytic Motor-Generators employ *Undercut Commutator Mica* to prolong commutator and brush life; *Pole Spacers* to help assure sparkless commutation; *Micrometer Adjustment of Interpoles,* an exclusive feature, to guarantee outstanding performance; *Correct Mechanical Design* that means every part of the motor-generator is swept by a cooling stream of air; and *Fully Accessible Construction* for easy inspection.



FOR INDUSTRIAL-TRUCK BATTERY-CHARGING

In 1910, The Electric Products Company introduced the first Automatic Battery Charger. Today they most efficiently and advantageously combine: completely automatic operation . . . the modified constant-voltage method of charging . . . individual application design . . . elimination of complicated control or ventilating systems . . . and specialized low-voltage designing.



FOR STANDBY BATTERY-CHARGING

Since 1923, Diverter-Pole Motor-Generators have proved to be the most reliable, maintenance-free and efficient source of direct current for Control Bus Battery Charging. They assure maximum battery life, give full-automatic operation and protect themselves against harmful overloads. Requiring only infrequent inspection, they are extensively used in isolated automatic and supervisory-controlled substations.

FOR INDUSTRIAL TESTING

The design and manufacture of Dynamometers, because of the very high operating speeds and the severe continuous-duty loads, require a manufacturing skill far beyond that needed for conventional equipment. The Electric Products Company has developed this background. Features include oversize bearings, heavy supports and framework, special commutator and armature construction.

● **Get the Facts on these and other E.P. Products . . .** For complete information, please contact your nearest E.P. representative or write to the address shown below:

EP

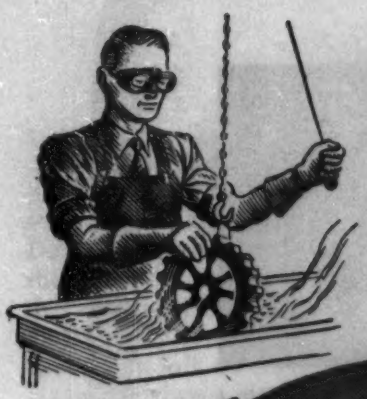
X-39

THE ELECTRIC PRODUCTS COMPANY

1728 CLARKSTONE ROAD CLEVELAND 12, OHIO

From Any Angle ...It's WILLSON For Safety With Comfort

Style V3-84C



A FLARE FOR PROTECTION . . . Side wings on this metal-edged, easy-to-wear Protecto-Shield* give extra protection . . . deflects splashing liquids from face, head and eyes.

Style X41

FOR SPLASH-PROOF EYES . . . Rolled, resilient edges of this Over-All* rubber mask goggle hug facial contours to keep out chemical splash and metal spatter. Tops in comfort and protection.

Style No. 701

DOUBLE BARRELED PROTECTION . . . Two replaceable chemical cartridge filters highly effective against low concentrations of vapors; provide low breathing resistance.

*Reg. U. S. Pat. Off.

For complete information on these products and their application, as well as many more eye and respiratory protective devices, get in touch with your nearest Willson distributor or write us direct.

GOGGLES • RESPIRATORS • GAS MASKS • HELMETS

DOUBLE WILLSON PRODUCTS INCORPORATED

READING, PA., U. S. A. Established 1870

219 WASHINGTON STREET, READING, PA., U.S.A.

preventing unit, sealed to the gage glass, which projects beyond the cover bolts so that the frost cannot build up across the vision slot in the cover forging. Available in both reflecting and transparent types. Tubular gages having double-wall glass with a vacuum between the walls also available. Since no air comes in contact with the glass in these gages, there is no condensation, therefore the glass does not frost. Jerguson Gage & Valve Co., 80 Fellsway, Somerville 45, Mass.

•

Soap Dispenser

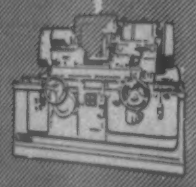
Single moving part in dispenser of granulated, bead, or powdered soap measures uniform quantity, dispenses it, and returns to loading position as pressure on operating lever is released, claims the maker. Unit is filled through a perforated diaphragm which prevents pilfering even though device has no lock or catches. Dispenser contents are agitated each time it is used by a spiral wire attached to the operating plunger. Central Products Co., 214 West Ohio St., Chicago 10.

•

Tractor Winch

Single drum unit, called Tractowinch, when attached to wheel-type tractors has a maximum capacity of 7500 pounds single line pull on the first layer of cable, according to

GRINDING WHEELS



GRINDING MACHINES

REFRACTORIES

NORBIDE

NON-SLIP FLOORS

LABELING MACHINES

ABRASIVE PAPER AND CLOTH • • • SHARPENING STONES

EVEN YOUR GOLF DEPENDS ON ABRASIVES . . .

PRECISION in your golf game demands precision in your clubs. And Norton abrasives help make that precision. The forgings for your "irons" are rough ground as illustrated and then the club faces are precision finished on disc grinders. The hosel for the shaft is centerless ground and then the whole club head receives several polishing operations with succeedingly finer sizes of ALUNDUM abrasive. And in the sanding operations on your "woods" the products of the Norton Behr-Manning Division are widely used.

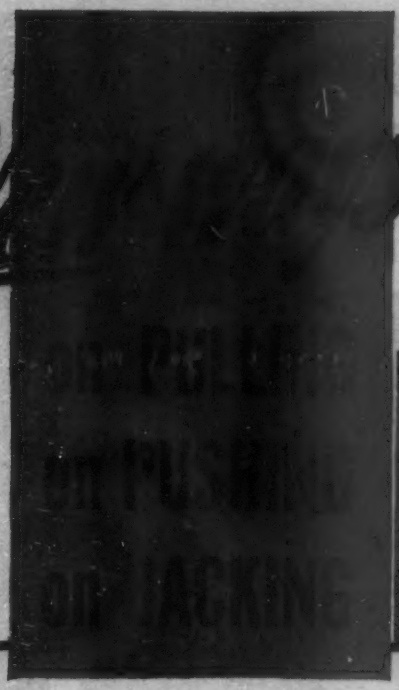
Yes, abrasives are important to you for they had a part in producing about every product you use — from the alarm clock that wakes you in the morning to the refrigerator that furnishes your midnight snack. And wherever abrasives are used you'll find Norton — for Norton is the world's largest producer of abrasives and grinding wheels.

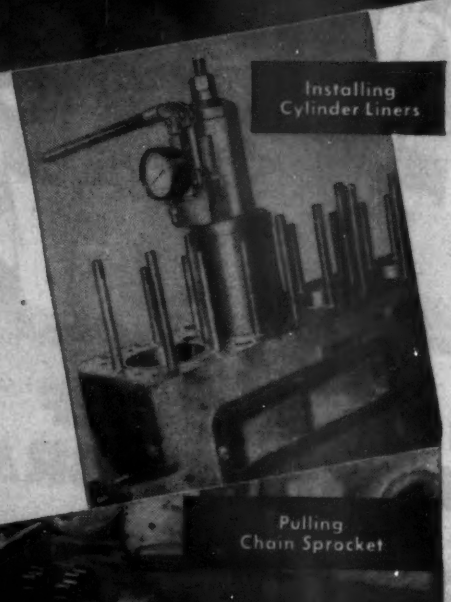
NORTON

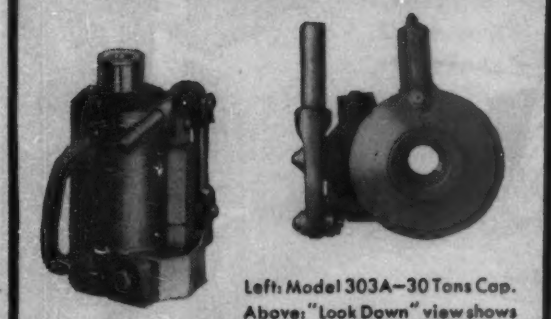
NORTON COMPANY • WORCESTER 6, MASS.

(Behr-Manning, Troy, N. Y., is a Norton Division)

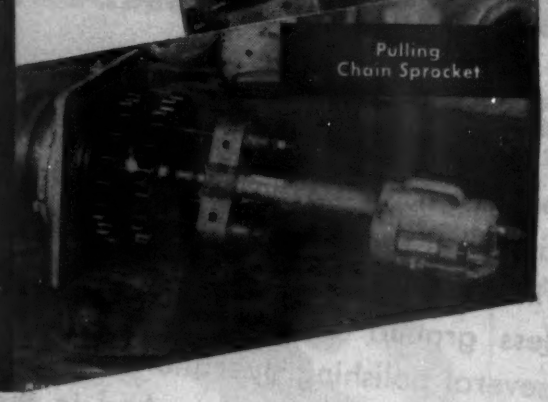
...s to SAVE







Left: Model 303A—30 Tons Cap.
Above: "Look Down" view shows center hole construction.



SIMPLEX-JENNY
CENTER HOLE
HYDRAULIC
PULLER

Here's the *modern* tool for easily and quickly pulling or pushing wheels, gears, cylinder liners, valves, bushings and similar tough jobs. The versatile Simplex-Jenny, with its exclusive center-hole principle, brings direct-line hydraulic power into play; eliminates the torque action of old-fashioned screw type pullers. You save time and money doing scores of pulling and pushing jobs easily and *safely* in minutes *(yes minutes!)* instead of hours. Simplex-Jenny is portable and compact; five models with 30 to 100 ton capacities.

Get proof of savings with a free demonstration in your plant; or write for new bulletin: Hydraulic 48.

SIMPLEX HYDRAULIC JACKS — 3 TO 100 TON CAPACITIES

Model 3HJ 3 Tons | Model 5HJ 5 Tons | Model 8HJ 8 Tons | Model 12HJ 12 Tons | Model 20HJ 20 Tons | Model 30HJ 30 Tons | Model 50HJ 50 Tons | Model 100HJ 100 Tons

Simplex
LEVER • SCREW • HYDRAULIC
Jacks

TEMPLETON, KENLY & CO.
1018 South Central Ave., Chicago 44, Ill.

manufacturer. Fairlead rollers allow offlead of the cable to either side, and a drawbar built into the winch frame permits performance of regular towing jobs without removing the winch. American Hoist & Derrick Co., 63 South Robert St., St. Paul 1, Minn.

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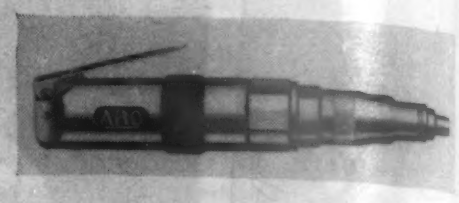


Pneumatic Screwdriver

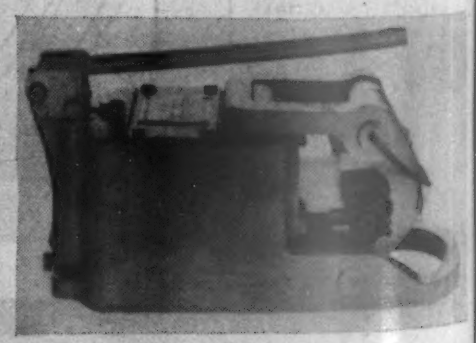
Twelve models of piston and lever type air screwdrivers and nut setters have positive or friction clutch, and range from 450 to 1100 r.p.m. Because of their high driving torque, tools are said to drive ¼-in. screws and bolts at high speeds, handle up to 5/16-in. bolt sizes at 450 r.p.m. Slow speeds of 450 to 750 r.p.m. are claimed to be suitable for self-tapping screws and cross recessed head screws. Standard equipment includes 8 feet of ¾-in. hose and fittings, one finder, and three bits. Suspension bale furnished on all lever models. Aro Equipment Co., Bryan, Ohio.

•

Dump Tractor

Powered by International Harvester heavy-duty 6-cylinder engine, dump truck, called Model J233PLD Shop Mule, 1½-yd. capacity, handles sand, gravel, coal, scrap, or other loose bulky materials up to 4000 pounds. Manufacturer states that it has a towing capacity of 60 tons on dry level concrete, and may be used in conjunction with rotary sweeper brooms or snow plows. W. F. Hebard & Co., 336 West 37th St., Chicago 9.

•



Wire Rope Cutter

Wire cutter, called Hydrashear, designed to speed up wire rope repair

nd shorten equipment lay-ups, has aximum capacity of 1½-in. wire ope, and can be operated in any osition. Of all-steel construction, nit is manually operated, self-con-ained, and does not have to be an-hored when in use. Cutting blade an be removed for resharpening or eplacement. Over-all dimensions, 8x6x8½ inches; weight, 70 pounds. Pell Cable Cutter Co., 55 New Mont-omery St., San Francisco 5.

Double Hook Hand Truck

Lower hook-arm of hand truck, alled Hook-'N'-Haul, grabs lower dge of boxes or crates, while the pper hook reaches over and grips he opposite side. Tilting carrier late is constructed of parallel steel lates, and is balanced, states manu-facturer, so that forward movement f the hook-arm places it in loading osition. In pulling position, plate utomatically tilts back off the floor. f steel-welded construction, truck s equipped with a one swivel and wo stationary casters, either steel r rubber. Techtmann Industries, 714 West Wisconsin Ave., Milwaukee 1.

Time Synchronization System

Designed to provide uniform time to he second on clocks throughout the lant, electric time system, electron-ically regulated, connects all clocks irectly to alternating current sup-ly without special wiring. A master

OUT OUR WAY

THIS ONE SAYS THAT IT'S JUST AS GOOD AS SOL-SPEEDI-DRI-- AND IT'S A QUARTER OF A CENT PER POUND CHEAPER!
DON'T GIVE ME THAT! THERE AIN'T ANYTHING AS GOOD AS SOL-SPEEDI-DRI! AND I'D PAY A QUARTER OF A CENT A POUND MORE ANY DAY TO BE SURE I'M GETTING MY MONEY'S WORTH! DON'T COME IN HERE AGAIN WITH THAT "JUST AS GOOD" STUFF! WE'RE STICKING TO SOL-SPEEDI-DRI!
STILL AN OLD MAIN STREET BOY -- STILL BELIEVES IN GETTING THE BEST FOR THE JOB--NOW YOU SEE WHY HE'S THE BOSS!
TELLIN' 'EM OFF
J R WILLIAMS
T. M. REG. U. S. PAT. OFF.
COPR. 1948 BY NEA SERVICE, INC.

Be Safe . . . Be Sure . . . Use SOL-SPEEDI-DRI

People who use SOL-SPEEDI-DRI—industry's original and foremost absorbent for all liquids—have learned that they can count on the uniformly high quality of SOL-SPEEDI-DRI. They have learned, too, that SOL-SPEEDI-DRI costs *less* because it does *more* work . . . because it is always efficient, always dependable.

Yes, it's quality all the way with SOL-SPEEDI-DRI . . . quality that assures you cleaner, brighter, safer floors . . . freedom from slips and falls caused by dangerous, slippery surfaces. Obtained by selective mining, laboratory-checked hourly, and processed by the most modern methods and equipment, SOL-SPEEDI-DRI comes to you in special weather-proof bags, *every* pound at peak efficiency. Remember the name . . . SOL-SPEEDI-DRI!

WHEN YOU BUY, BE *SURE* IT'S SOL-SPEEDI-DRI!

Safety and Maintenance Co., Inc., No. 1 Wall St., New York 5, N.Y.

Warehouse Stocks Maintained in Principal Cities of the United States and Canada

You take your choice at . . .

CAST BRONZE
Plain or Graphited
In any Alloy

SHEET METAL
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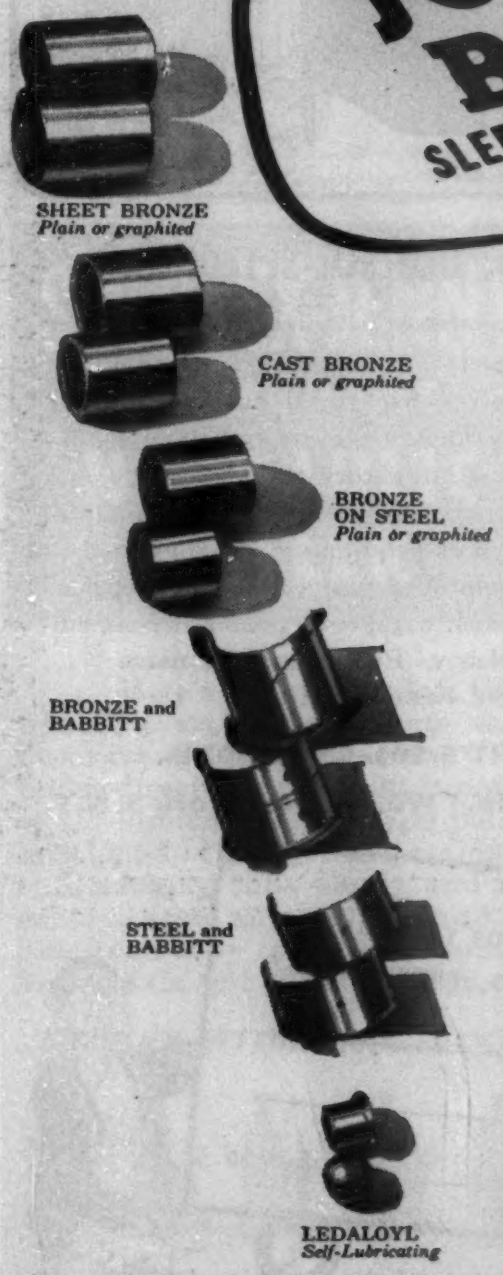
BABBITT LINED
Bronze Back
Steel Back

SELF-LUBRICATING
Ledaloyl . . . powder metallurgy

JOHNSON BRONZE
SLEEVE BEARING HEADQUARTERS



SELECTING the *RIGHT* bearing for each application is an easy matter when you come to Johnson Bronze. You simply tell us what you expect of the bearing . . . the load it must carry . . . the speed at which it will operate . . . the type of lubrication that will be used. Armed with this data and any other pertinent operating facts we can tell you *which* type of bearing will give you the greatest service for the longest period of time at the lowest possible cost.

As we manufacture *ALL* types of Sleeve Bearings we base all of our recommendations on facts . . . free from prejudice . . . supported by more than forty years of bearing experience. Isn't this the type of bearing service you can use? Our advice and assistance are at your disposal NOW . . . without obligation. Why not get in touch with us today? Excellent delivery is now possible on practically all types of Sleeve Bearings.

JOHNSON BRONZE COMPANY
512 South Mill St. New Castle, Pa.

BRANCHES IN 20 INDUSTRIAL CENTERS

OVER 40 YEARS' EXCLUSIVE BEARING EXPERIENCE

time control "directs" the entire system. Every hour a supervisory impulse is sent out through electronic tube action in the transmitter in this control to receivers in each clock in the system. If any clock is slower or faster than the control, it is automatically corrected. Automatic sounding of bells, horns, buzzers, gongs, or chimes may be provided through the program unit of the master control, also without special wiring. Self-regulating minute impulse units, attendance time recorders, job cost recorders, time stamps, and similar equipment may be operated through an adapter. International Business Machines Corp., 590 Madison Ave., New York.

•

Hand Truck

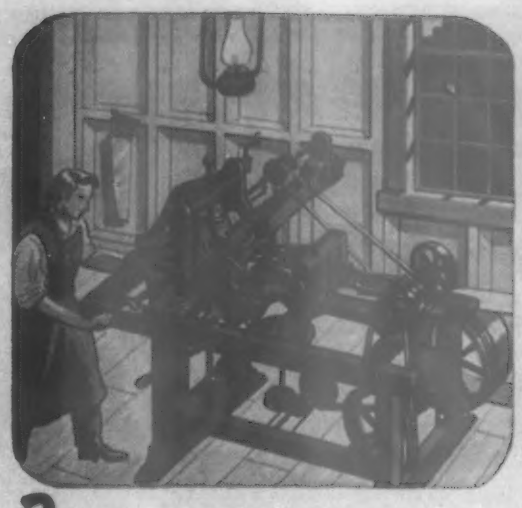
Suitable for moving heavy objects, two-wheel hand truck rolls on four 10x3.50-in. four-ply pneumatic tires. Load is supported on bearings placed on spiral springs to absorb shocks imposed on the axle. A safety brake keeps the truck from moving while being loaded or unloaded. Handles and frame are of steel-armored hardwood. Four cross bars are woodbound, secured with countersunk bolts, so that no metal touches the load. Truck is 24 inches long, with 60-in. handles; weighs approximately 125 pounds. West Bend Equipment Corp., West Bend, Wis.

•

Oil Circuit Breaker

For use in outdoor distribution substations, medium capacity oil circuit breaker, Type JCE, is made in 14.4 and 23-kv. ratings from 100 to 250,000-kva. interrupting capacities. Motor-compressed spring-operating mechanism opens the breaker, either automatically or manually. Timer or relay recloses it, either immediately or with time delay, providing one to three reclosures, as indicated, before a persistent fault causes breaker to lock open. High-velocity gas blast

1 **1827**—Early machine tools were a result of shop owner and mechanic tinkering around, trying to step up output. They were hand built, crude, and no two machines were alike, since measurements were not yet standardized.



2 **1855**—Gradually, methods and techniques became more uniform, more exacting. Machine tools developed for one industry were tried successfully in others. But the *real* power behind machine tools, low-cost electricity, was still to come.

3 **1915**—Howell "Red Band" Electric Motors appeared. Applied to lathes, grinders, cutters, shapers and other machine tools, these rugged, industrial-type motors soon won wide acclaim for making good on hard jobs.

THEN, AMERICA TOOLED-UP!

4 **Today**—Machine tools, operated by skilled workers, help put more goods in the hands of more people, at less cost!

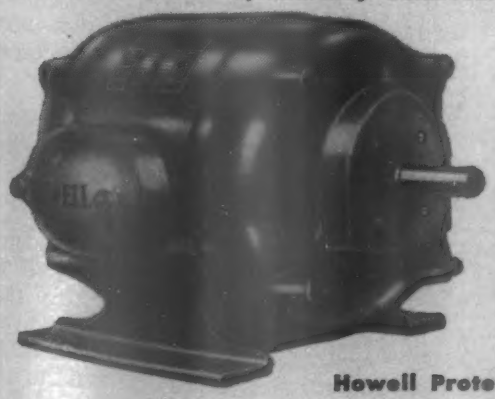
America is really tooled-up! And Howell Motors have helped. In thousands of shops, they are recognized as tops for the tough jobs.

These dependable precision-built motors are also an important source of power for pumps, fans, conveyors and other vital industrial equipment.

Are *you* using Howell Motors?

Free enterprise encourages mass production, supplies more jobs—provides more goods for more people at less cost.

Here's another precision-built Howell Motor . . . industrial type with copper or bronze bar rotors . . . specially insulated . . . statically and dynamically balanced.



Howell Protected Type Motor

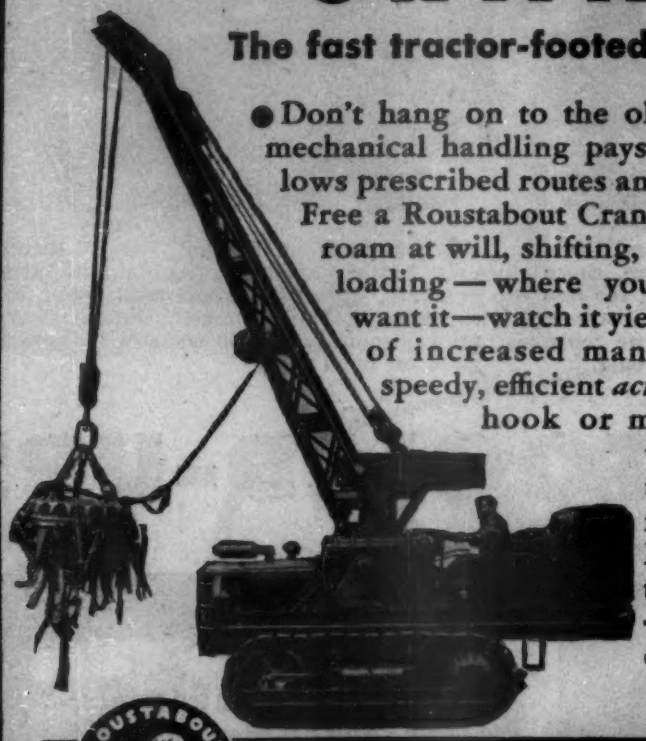
HOWELL MOTORS

HOWELL ELECTRIC MOTORS CO., HOWELL, MICH.

Manufacturers of Quality Industrial Type Motors Since 1915

Mechanical handling in your yard pays too— with ROUSTABOUT CRANES

The fast tractor-footed load-hustlers



● Don't hang on to the old-fashioned idea that mechanical handling pays off only when it follows prescribed routes and methods — indoors. Free a Roustabout Crane in your yard — let it roam at will, shifting, stacking, loading, unloading — where you want it, when you want it — watch it yield pay dirt in the form of increased man hour savings — and speedy, efficient *action.* Loads to 7½ tons, hook or magnet, mounted on wheel or crawler tractors. Ruggedly built for years of overwork. Make your yard contribute to profits, too — get the Roustabout economy facts now.

Write to Dept. B-5.

HUGHES-KEENAN CORPORATION
DELAWARE, OHIO, U. S. A.
Load-Handling Specialists since 1904

SHOP MULES *preferred* BY 73 INDUSTRIES

Photo Courtesy Crown Cork and Seal Co. illustrates A-21 SHOP MULE

OPERATIONAL ADVANTAGES OF THE VERSATILE A-21

1. Large diameter pneumatic rear wheels for easy operation over track crossings and other rough ground.
2. Quickly adjusted to 6 overall widths 40½" to 61".
3. A separate hand brake for each rear wheel permits locking of one wheel to give shorter turning radius.
4. High ground clearance.
5. Adjustable draw bar effort (by adding wheel weights for extra traction).
6. FOUR forward speeds and one reverse.

MAINTENANCE ADVANTAGES

1. Very fast, world-wide parts and service. Parts are conveniently stocked all over the world. Therefore, parts are quickly available, *in your own area* — service is fast — there is a very minimum of delay for necessary replacements.

2. Replaceable cylinder sleeves ALL IN ONE SEALED PACKAGE. You may save 50% on this feature alone. New pistons and rings — already fitted in new cylinder sleeves (all in ONE Sealed Package)—provide virtually a new engine for about half the cost of the usual re-bore job. All this with an average *saving of several days lay-up time.*

Find out why famous International Harvester powered SHOP MULES are preferred in 73 Industrial Fields. Send for full specifications and operating data. Just tear out this ad and mail with your letterhead and name — TODAY!

W. F. HEBARD & CO.
336 W. 37TH STREET, CHICAGO 9, ILLINOIS

extinguishes the arc within 8 cycles after energizing the opening trip-latch, and first reclosure is in 30 cycles, according to manufacturer. Blades make or break contact simultaneously. Housing is weatherproof and provided with lockable doors to permit access from three sides. Pacific Electric Mfg. Corp. 5815 Third St., San Francisco 24.

•

Lamp Holder

Consisting of a steel base and stand attached by means of a wing nut clamp to a die-cast zinc socket housing, Type L65P adjustable holder is designed for use with 150-watt GE PAR-38 lamps. Base fits standard 3¼- and 4-in. outlet boxes. Socket is sealed against moisture and dirt by a treated asbestos gasket in the joint between lamp and holder, which comes with twin-conductor, weatherproof cord. Lighting & Rectifier Div., General Electric Co., Schenectady 5.

•

Insecticide

Non-staining insecticide, called CD-68, is said to be more effective and less toxic to humans and warm-blooded animals than DDT. It kills roaches, clothes moths, moth larvae, mosquitoes, flies, ants, and other pests. Spray application of the compound is said to remain effective for 5 weeks to 2 months after use. Manufacturer says that it is non-crystalline, leaves an invisible residue, but will not dull the finish of treated fabrics or affect the sheen or gloss of polished surfaces. Has a pine-like odor, and is available in concentrated form for dilution with water, or formulated with either an oil base or a non-flammable water emulsion. Processed Chemical and Coating Corp., 33 North 1 St., Brooklyn 11, N. Y.

•

Rectifiers

Regulated automatic rectifiers for heavy-duty applications have either electronic control for extremely fast response or magnetic amplifier control for vacuum tube elimination. Standard models offer current ranges

PAY
Rugs by KLEARFLAX
MILLS AND GENERAL OFFICES AT DULUTH, MINNESOTA
Rap-in-Wax
Waterbury
HIGH QUALITY FURNACES
3M
COMPANY
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565,000 Sunday • 435,000 Daily
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Scott-Atwater
TELEX
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Standard
GRAVITY & POWER CONVEYORS
PEERLESS CHAIN
ALL TYPES
PEERLESS CHAIN CO. - WINONA, MINN.
CARLEY
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Coolerator
Rid-Jid
A FAMOUS NAME IN AMERICAN HOUSEWARES
TUMICO
NORTHERN ORDNANCE INCORPORATED
MINNEAPOLIS 13, MINNESOTA
COLUMBIA HEIGHTS P.O.
THE FARMER
SAINT PAUL MINNESOTA
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ANDERSEN
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Life is
better in uncrowded
Minnesota where lakes, prairies and
great forests are yours to enjoy.
Here you will find a way of life
that is a happy combination of
work and play.
Minnesota concerns, like those
whose well known trade-
marks are shown here, have
found this way of life pro-
duces healthy, conscien-
tious workers, of which
there is a plentiful supply.
The growth and prosperity
of these companies is the
best evidence that Minnesota
is the place to locate your plant.
Come to Minnesota for your vacation
and investigate business locations while here.

A Cat always lands on its feet . . .

. . . but your factory workers don't. When they slip, skid, fall on slippery plant floors, they are often injured . . . then lost man-hours start piling up. Keep accidents to a minimum in your plant by installing U·S·S Multigrip Floor Plate in zones where sure footing is essential. Multigrip offers skid resistance and traction in all directions, wet or dry!

For safety, durability, economy you can't beat U·S·S Multigrip Floor Plate.

Get further information about Multigrip from your nearest steel warehouse or write to us direct.

CARNEGIE-ILLINOIS STEEL CORPORATION
Pittsburgh and Chicago
Columbia Steel Company, San Francisco, *Pacific Coast Distributors*
Tennessee Coal, Iron & Railroad Company, Birmingham, *Southern Distributors*
United States Steel Export Company, New York
8-539

UNITED STATES STEEL

from 5 to 10,000 amperes and from 10 to 500 volts. Industrial Electronics & Transformer Co., 1801 East Slauson Ave., Los Angeles 11.

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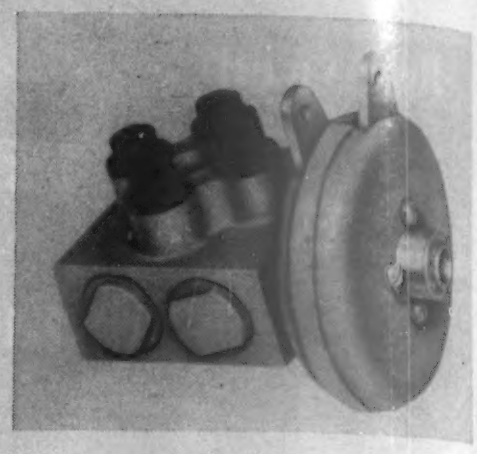


Selector Valve

Designed for manual or automatic operation, follow-up selector valve is adaptable to mechanical hydraulic systems for such applications as maintaining equal tension, multiple brake actuation, furnace control, steering devices, and machine tool controls. Unit is lightweight, and available in sizes to meet specific requirements. Electrol, Inc., Kingston, N. Y.

•

Bandsaw Blade

Flexible woodcutting bandsaw blade has tempered precision-set teeth. Breakage factor is reduced, says the manufacturer, by the fact that the backing is non-tempered. May be obtained in ¼-, ⅜-, and ½-in. widths and all lengths. Blade cannot be resharpened, but may be used on soft metal when dull. Alwood Co., 2135 West Charleston St., Chicago 47.

•

Change in Ownership

The recent purchase of the capital stock of the Case Crane & Kilbourne Jacobs Company has been announced by the Jeffrey Company. The Case Crane Company is engaged in engineering for the fabrication of structural steel for buildings and bridges. Located adjacent to the Jeffrey plant in Columbus, Ohio, the recently acquired firm will operate as a sub-

Use Hewitt Air Hose to power your pneumatic tool operations

Yes . . . you can be sure of maintaining efficient working pressure longer when you use Hewitt Air Hose.

Owners of metal products manufacturing plants, processing plants, steel mills, rolling mills and others have found this out.

You will, too. Just one look at this flexible, nonkinking hose and you'll see why Hewitt Air Hose withstands severe service.

If you could cut it apart you'd see an inner tube made of long-life rubber compounds to resist oil without swelling or flaking. You'd see a carcass of tightly twisted cord braids bonded with rubber compounds to assure high burst-resistance, without expansion and elongation.

And, of course, you'd notice that the tough cover is built for maximum protection against severe abrasion, impact, sun-checking, weathering.

So insist on Hewitt Air Hose for *your* pneumatic tool operations. Phone the Hewitt distributor listed in the classified section of your telephone directory today. Or write to Hewitt Rubber Division, 240 Kensington Avenue, Buffalo 5, N.Y.

HEWITT

AIR HOSE

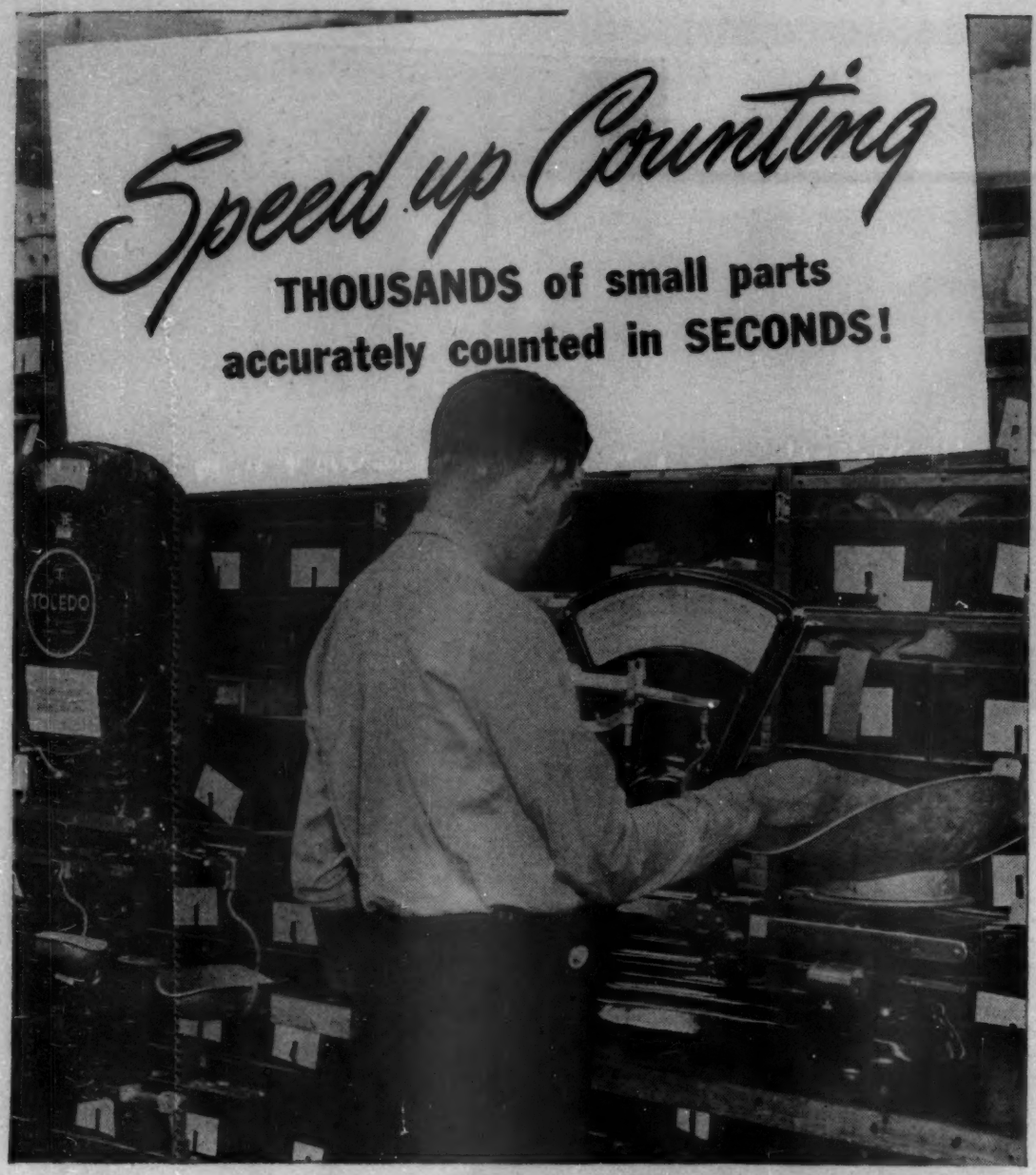
HEWITT OFFERS YOU THESE 3 TYPES OF AIR HOSE

1 Monarch. Molded and braided air hose used where hot oil conditions are especially severe. This is a top quality, highly flexible, yet nonkinking air hose built for most severe air tool and compressor service, where strongest and sturdiest in hose construction is needed.

2 Ajax. Wrapped duck air hose used when a general service, reliable type is required. Designed for moderately severe pneumatic tool operations.

3 Conservo. Molded and braided air hose for general air tool service such as riveting and chipping hammers.

HEWITT RUBBER DIVISION **HEWITT-ROBINS INCORPORATED**



Control Costs with TOLEDO Accuracy!

Several of the Toledo Counting Scale models can be used for weighing as well as counting.

Heavy capacity models for counting large parts or large quantities.

Keep an accurate watch over the flow of parts in your production with Toledo Counting Scales! *Count by weight* with a Toledo when issuing pre-determined quantities of uniform parts . . . counting unknown quantities . . . for *faster inventory counts* . . . or to get accurate receiving, shipping, production, cost and piece-work counts. Complete selection of models . . . for parts weighing only a few grains . . . up to total counting capacities of several tons. Also choice of double and triple ratio combinations. Toledo Scale Company, Toledo 12, O.

SEND FOR BOOKLET 2204 ➤

TOLEDO
HEADQUARTERS FOR SCALES

sidiary of the Jeffrey Company. No changes in management or policies are contemplated.

•

Chemical Pump

For use where electrical power is not available, chemical pump, called Airometric, in Simplex and Duplex models, is powered by a 1-hp. rotary air motor, operated by natural gas or compressed air, at pressures from 50 to 80 p.s.i. Pressure regulator and indicating gage reduce supply pressure to that required for pump operation. Maximum motor speed is 1750 r.p.m., held constant by a governor which throttles the exhaust from the motor. Drive is through a speed reduction unit. Motor and mechanical system are balanced by means of a flywheel fixed to the motor coupling. Milton Roy Co., 1311 East Mermaid Rd., Philadelphia 18.

•

Trolley Conveyor

Overhead cable-type trolley conveyor features roller chain driving sprocket said to permit trolley spacing to 1¼-in. increments. Trolleys are cast split design to eliminate threading on cable and to facilitate adding, removing, or changing of centers. Conveyor will operate in horizontal plane, or with 45-deg maximum rise or dip on vertical plane. Smith Power Transmission Co., 1545 East 23rd St., Cleveland.

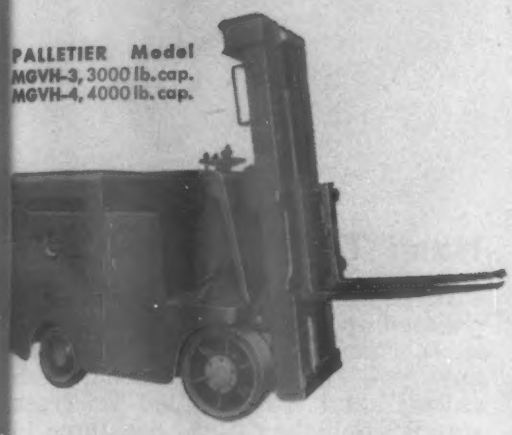
•

Window Platform

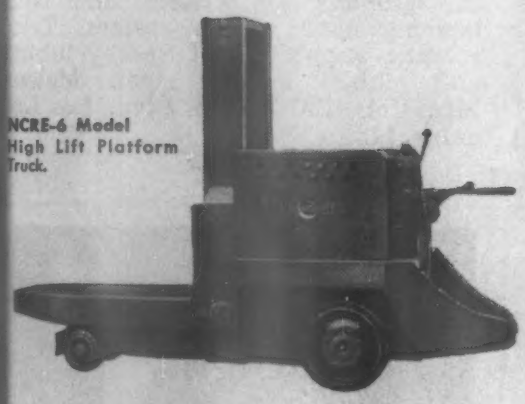
Designed to provide security and save time for maintenance men working on the outside of windows, platform rests on the outside sill, and is held in position by brackets and an adjustable bar of rail carbon steel tubing on the inside of the window. Rubber guards on the bar

The cheapest distance between two points is

AISLE SAVER, Model LHVH PALLETIER. Stacks from 8-ft. aisles. 2000 lb. cap.



PALLETIER Model MGVH-3, 3000 lb. cap. MGVH-4, 4000 lb. cap.



NCRE-6 Model High Lift Platform Truck.

CRESCENT ELECTRIC INSTALLATIONS ARE JOB-ENGINEERED

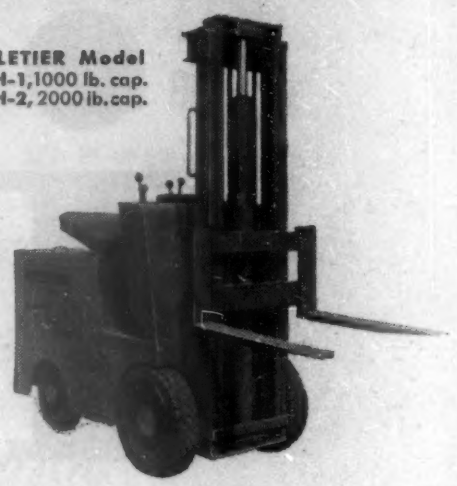
Men who live with materials handling from day to day are aware of the diversity of problems arising in dissimilar operations.

They know that the selection of handling equipment is controlled entirely by operating requirements. Before installing such equipment, at your request, Crescent Engineers will chart each phase of product handling in order to obtain maximum efficiency from the unit.

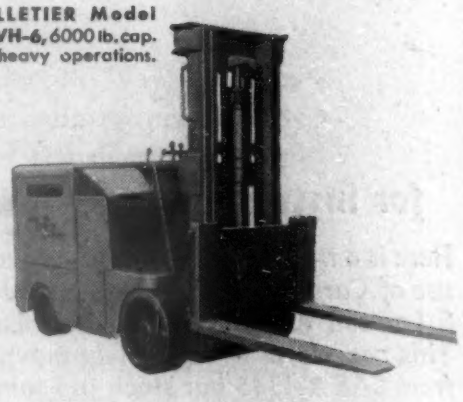
LOADING REQUIREMENTS DETERMINE MODEL SELECTIONS

Special adaptations may be made to conform with the requirements of varying shapes, sizes and weight of materials to be handled. The simplicity of Crescent design assures long life—smooth, safe, efficient operation—minimum maintenance.

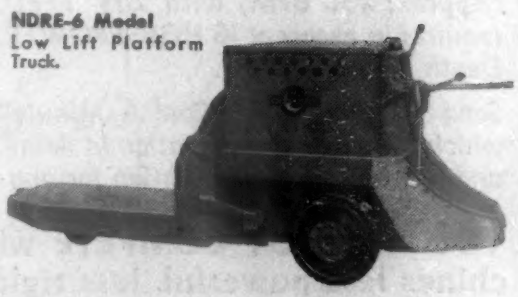
Complete specifications for any unit or recommendations for specific installations will be furnished on request.



PALLETIER Model LGVH-1, 1000 lb. cap. LGVH-2, 2000 lb. cap.



PALLETIER Model MGVH-6, 6000 lb. cap. For heavy operations.



NDRE-6 Model Low Lift Platform Truck.

CRESCENT Tractor Model MTT, for heavy duty use.

CRESCENT Midget Tractor Model LTT, for light operation.

CRESCENT Tractor Model MTW, for general use.

CRESCENT TRUCK COMPANY

LEBANON, PENNSYLVANIA

Industrial Truck and Tractor Specialists Since 1917

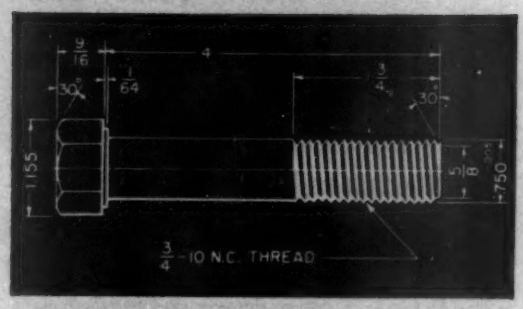
YOU CAN CUT YOUR TURNING COSTS

if

your lathes have the Power, Rigidity and Spindle Speeds to use Carbide Tools effectively

for instance . . .

Here is a typical example of the effective use of Carbide Cutting Tools on a Jones & Lamson #3 Ram Type Turret Lathe. This cap screw is completely machined from SAE X-1335 bar stock in 1 minute. The turning cut, taken at 1500 RPM (Approx. 450 SFM) with .015" FEED, requires in excess of 16 HORSEPOWER. Depth of cut is .205".



Send for our folder "One A Minute" which describes this operation in detail, and contains vital information for anyone contemplating the purchase of a Turret Lathe, or wishing to better his turning operations.

YOU CANNOT COMPETE with production like this with machines less powerful, less rigid.
Jones & Lamson Lathes guarantee your investment.
***They anticipate* the future in metal turning.**
***They are built* with great reserves of ruggedness.**
***They are powered* to meet even more than today's requirements for the effective use of carbide tools.**
Let a Jones & Lamson engineer study your turning operations. He will be able to make recommendations that will improve your profit picture. He has for others.

JONES & LAMSON MACHINE COMPANY
Springfield, Vermont, U. S. A.

Manufacturer of: Universal Turret Lathes · Fay Automatic Lathes · Automatic Double-End Milling and Centering Machines · Automatic Thread Grinders · Optical Comparators · Automatic Opening Threading Dies and Chasers · Ground Thread Flat Rolling Dies

Jones & Lamson Lathes
ARE POWERED FOR CARBIDE

protect interior finish. Each of two brackets which brace the platform against the side of the building is tested for 800 pounds; guard rail is 34 inches high. The unit weighs 32 pounds, and is adjustable for varying wall thicknesses and windows up to 4 feet wide. Obtainable for windows up to 7 feet wide on order. Industrial Products Co., 2820 Fourth St., Philadelphia 33.

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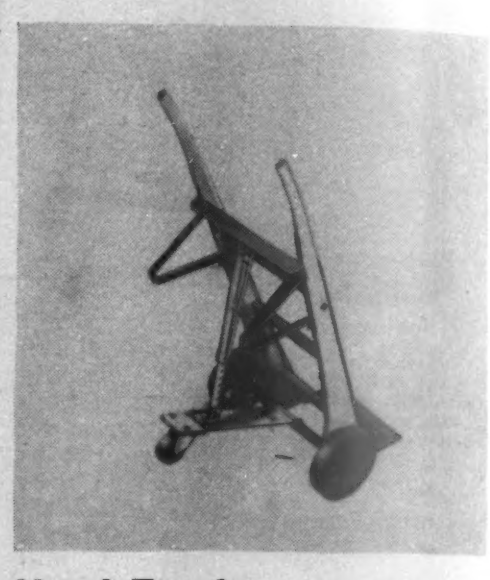


Hand Truck

Incorporating a telescopic support claimed to adjust and lock instantly to the correct balance position for any type and weight of load, mechanized hand truck, called Tri-Truck, stands 56 inches high, has three 10-in. rubber-tired wheels, and ball-bearing hard rubber casters. Telescoping support is of Shelby tubing and ribbed welded steel. Melooz Mfg. Co., 4730 Avalon Blvd., Los Angeles 11.

•

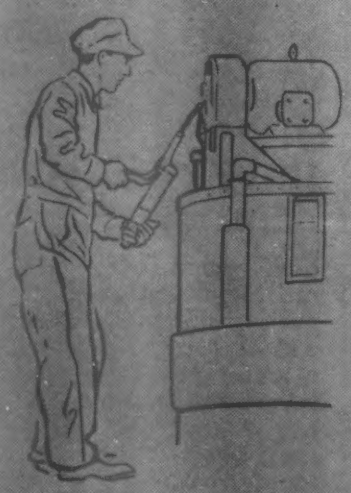
Interval Timer

Powered by a synchronous, self-starting, permanently lubricated Telechron motor, T-48 timer operates on a 120-volt, 60-cycle a.c. circuit with maximum load of 1200 watts. Enclosed in an acid-resistant case, it weighs 2 pounds. Triple action control knob permits manual or automatic operation. Control timing pointers are made of anodized aluminum. Dial is protected by shatterproof plastic window. Unit resets automatically at the end of any cycle. Available for 0 to 120 seconds, 0 to

Better your "Break-Even" point...

from drum to filler pump 1

from filler pump to grease gun 2



from grease gun to fittings 3

LINCOLN

Complete Original Container to Bearing

LUBRICATING METHODS

cut maintenance time!

boost production time!

Engineered lubrication, the Lincoln Way, helps increase plant efficiency. It cuts maintenance time by providing a speedy method of transferring and applying lubricants. It minimizes down-time, caused by bearing failure—valuable time that can be used to boost production.

To make sure that lubrication is on a par with other vital maintenance factors, install a Complete Lincoln Original Container to Bearing System and improve your "break-even" position.

ask your wholesale distributor!

Your Lincoln Distributor will gladly show you the lubricating equipment you need for top efficiency. Ask him for a copy of Lincoln Catalog No. 63. Consult him or any of the Lincoln branches listed below for help in solving your lubrication problems.

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BRIDGEPORT—H. G. Davis, Inc.—Bridgeport 5-8160
CHICAGO—Lincoln Engineering Co. of Ill.—Calumet 6022
CLEVELAND—Lincoln Lubricating Systems, Inc.—Express 4334
DETROIT—Lincoln Engineering Co.—Madison 3484
EAST ORANGE—Lincoln Lubricating Systems, Inc.—Orange 3-3188
FORT WORTH—Fritz Keller—2-1345
LOS ANGELES—Lincoln Engineering Co. of Calif.—Richmond 0151
MILWAUKEE—Lincoln Equipment Service—Division 1191
NEW YORK—Lincoln Lubricating Systems, Inc.—Trafalgar 7-7900
OAKLAND—Lincoln Engineering Co. of Calif.—Higate 6130
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● *Apply the right lubricant* ● *In the right quantity* ● *At the right time!*

Lincoln is the originator of the Kleenseal Surface Check Grease Fitting—the new, modern fitting with the ball in the top.

LINCOLN

LINCOLN ENGINEERING COMPANY
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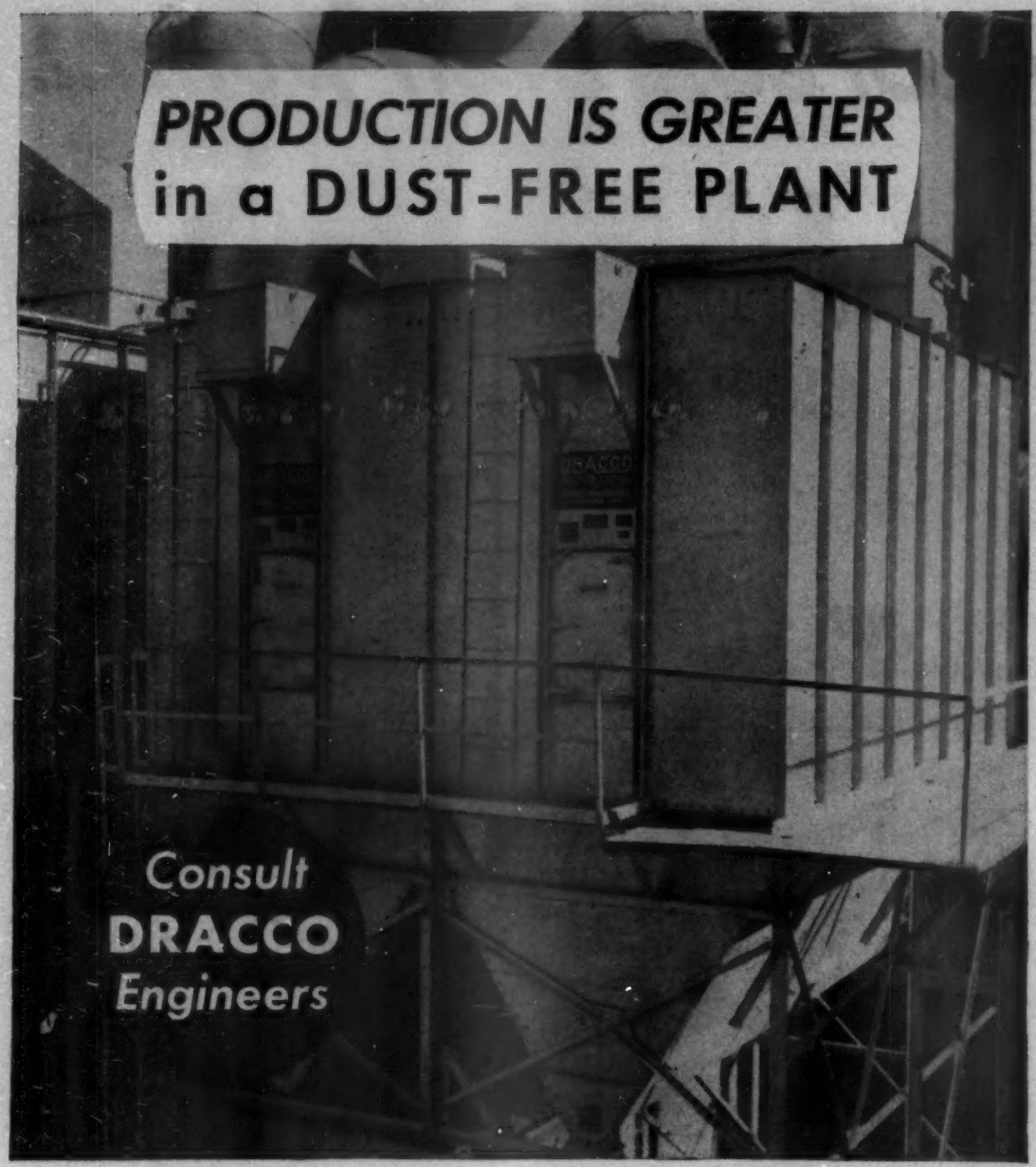
5701 NATURAL BRIDGE AVE., ST. LOUIS 20, MO.

B48-22



If the production losses, direct and indirect, caused by dust could be computed it would amount to a staggering figure each year. DRACCO Dust Control creates better working conditions — reduces the cost of maintenance and prolongs the life of equipment, general plant efficiency is improved and results in greater production. Good working conditions attract better workers. Even a small amount of dust is costly and should be given serious consideration. Why not consult DRACCO Engineers? They have over 30 years experience in dust and fume control.

DRACCO CORPORATION

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DUST CONTROL EQUIPMENT
PNEUMATIC CONVEYORS • METAL FABRICATION

15 minutes, 0 to 2 hours, or 0 to 12 hours. Meter & Inst. Div., General Electric Co., Schenectady 5.

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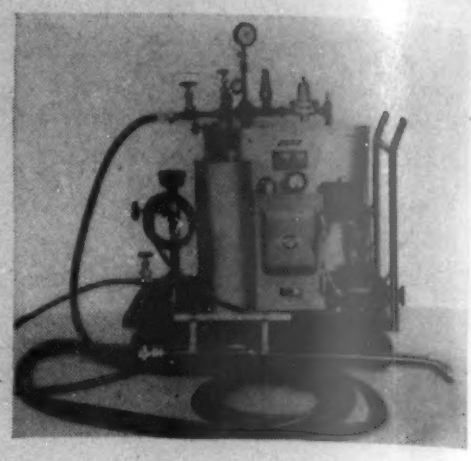

Steam Cleaner

Developed for cleaning walls, ceilings, windows, and fixtures; sterilizing and cleaning washrooms; degreasing machinery, equipment, parts, and tools, Speedylectric steam-jet cleaner weighs about 400 pounds. Unit is mounted on an all-steel dolly with ball-bearing rubber-tired swivel casters. High-pressure steam and detergent hose, nozzle, and controls included. Floor space required, 26x42 inches. Operates on a.c., 220 volts and over, single or polyphase. Livingstone Engineering Co., 100 Grove St., Worcester 5, Mass.

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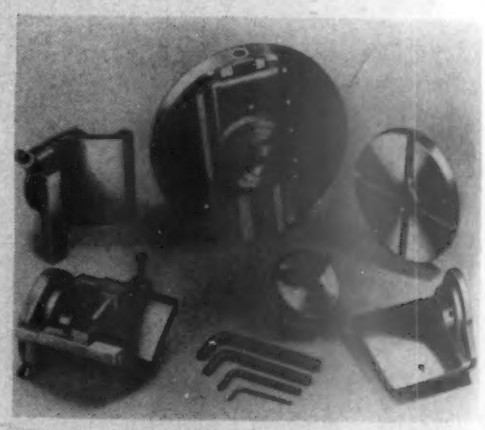

Lathe Conversion Attachment

Conversion of a MM lathe into a milling machine, boring machine, or drill press can be accomplished by use of Multi-Purpose face plate and attachments, according to manufacturer, who states that operations at any radial or angular relation to each other can be performed without moving the work from its original position in a fixture. Attachments consist of a vertical "V" block, an auxiliary "T" slot face plate, 3-jaw chuck, angle plate, and a horizontal "V" block with clamp. Dept. D., Superior Mfg. Co., 1302 Ontario St., Cleveland 13.

•

Protective Coating

Corrosion resistant coating, called Carbo-Kote, was developed for use on wooden tanks, floors, racks, tables,

You Can *Button Up* Metal, Wood, and Plastics

FASTER, BETTER, and CHEAPER with these POWER HAND TOOLS

KELLER
Pneumatic
Screw Drivers

Grip the comfortable handle! Note the steady, powerful drive. Various handle styles, bits, and finders adapt drivers to many applications.

KELLER
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Nut Setters

You'll like the way Keller nut setters nose into awkward spots. No operator fatigue. They're light, compact, and powerful.

Keller Tools on Production Line in RCA Corp. Plant

KELLER *Pneumatic Tools*

SEND FOR THIS CATALOG

Catalog No. 12 is a useful handbook. Suggests ways that modern air tools can bring new economies, speed, and convenience to your production line.

KELLER TOOL COMPANY • 4810 MARTIN STREET • GRAND HAVEN, MICH.

means more profit . . .

A 'Budgit' Electric Hoist means more profit to the man who uses this fast, easy-to-operate hoist to do his lifting at machines, at assembly benches, production and inspection lines.

'Budgit' Electric Hoists lift and handle loads so easily, they conserve the worker's energy and allow him to turn it into increased production. 'Budgit' Hoists lift so speedily, they add many minutes to every working hour in the day — and, time saved means increased profits. With production up, operating costs go down. That's profit, too!

The cost of installing a portable 'Budgit' Hoist is nothing, for a 'Budgit' is a complete lifting unit in itself. You simply hang it up, plug into the nearest electric socket, and use! That means production begins immediately. Savings, too!

Made in sizes to lift 250, 500, 1000, 2000 and 4000 lbs. Prices start at $119. Write for Bulletin No. 371.

MAXWELL MANNING MM&M MOORE INC. TRADE MARK

'BUDGIT' *Hoists*

MANNING, MAXWELL & MOORE, INC.
MUSKEGON, MICHIGAN

Builders of 'Shaw-Box' Cranes, 'Budgit' and 'Load Lifter' Hoists and other lifting specialties. Makers of Ashcroft Gauges, Hancock Valves, Consolidated Safety and Relief Valves and 'American' industrial instruments.

fume hoods, and similar equipment. Maker states that it can be immersed in water, boiled indefinitely, and will not soften or come off. Said to resist most acids, alkalis, and solvents with the exception of nitric or sulphuric acid of over 45 per cent concentration. Wood treated with the substance has been known to char under great heat, yet coating itself has remained intact, according to manufacturer. Sets by polymerization at room temperature. Carboline Co., 502 North Taylor, St. Louis 8.

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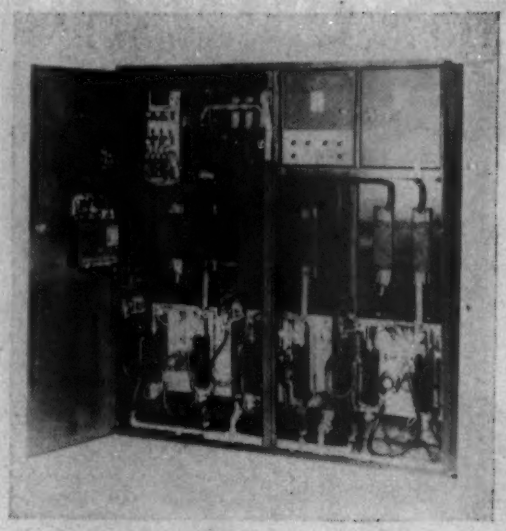

Welding Control Combination

Remote control relay-timer incorporated in 3-phase multiple control combination, Model 312KS2, provides a variety of multiple welding sequences, Weld Nos. 1, 2, 3, cascade, or simultaneous, with independent dial adjustment of weld time on each phase. Automatic control circuit protection also incorporated. Built-in disconnect switch or circuit breaker is available so that power may be wired directly to the unit. Circuit breaker with interrupting capacity to 50,000 amperes may be supplied.

Standard equipment includes built-in water saver, with solenoid-operated water valve and water lines housed within the cabinet. A magnetic contactor for remote control, or motor starter, and 1 to 3 kva. step-down transformer are available as auxiliary equipment. Complete control over 3, 6, or 9 transformer groups may be accomplished using auxiliary timers, according to the manufacturer. Weltronic Co., 19452 West Eight Mile Rd., Detroit 19.

•

Combination Screwdriver

Reversible chrome vanadium steel blade, oil tempered, is designed so that combination screwdriver, called Duplex Reversible, will accommo-

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You get many "extras" when you use Gilmer Multiple V-Belts. They all add up to pulling power, long life and economy.

EXTRA GRIPPING POWER is provided by straight wall construction. Sides bulge outward as they flex around sheaves, yet unlock freely the instant pressure is released.

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EXTRA TOUGH JACKETS... highly resistant to wear... assure added months of service.

EXTRA WIDE VARIETY... all standard and many special sizes. Gilmer V-Belts are made on the largest assortment of V-Molds in the world. Supplied in special constructions to withstand excessive oil or heat, and to dissipate static; and with pulling element of nylon, rayon or steel wire to meet severe operating conditions.

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THERE IS A GILMER POWER TRANSMISSION BELT FOR EVERY NEED

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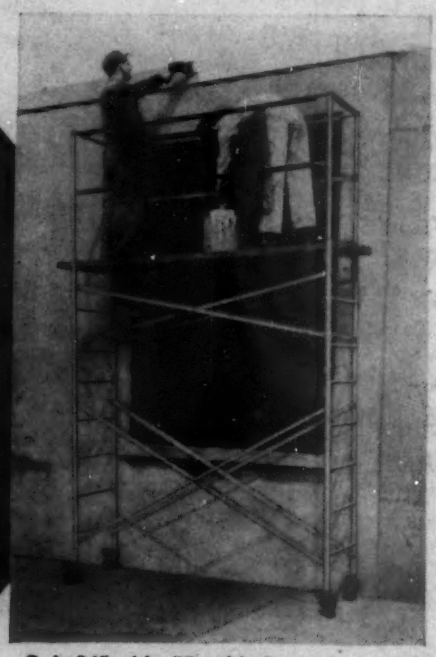
GOLD MEDAL LADDERS SCAFFOLDING



Only 24" wide, "Trouble Savers" are ideal for narrow aisles and hard-to-get-at places where working space is limited. Ladders available in four heights.

Safe! Efficient! Economical!

All maintenance jobs go faster—in *greater safety*—on "Trouble Saver" Ladder Scaffolding. They're useful for many types of work. Easy to erect and move, "Trouble Savers" store in minimum space. Planks across the rungs permit extra adjustability. Welded tubular steel construction protects your men.

- Tubelox Tubular Steel Scaffolding
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- Steel Scaffold Brackets
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date both Phillips and regular screws. Available in two sizes: No. 1 Phillips point and 3/16-in. regular, and No. 2 Phillips point and ¼-in. regular. Vaco Products Co., 317 East Ontario St., Chicago 11.

•

Magnetic Starters

Line of a.c. magnetic starters for non-reversing, across-the-line starting of single phase and polyphase squirrel cage induction motors is designated Bulletin 4111 Size 1. Available with open-type construction or with NEMA Type 1 general purpose enclosures, starters are suitable for use with separate pilot devices for 2 or 3 wire remote control, or can be supplied with local control pushbutton stations or selector switches. They have a maximum enclosed rating of 7½ horsepower, 440-550 volts, 3 phase, 60 cycles. Ward Leonard Electric Co., Mount Vernon, N. Y.

•

Inert-Gas Welding Attachment

Magnetic contactor on high frequency stabilizer turns welding current and high frequency on and off, and operates the magnetic valves for turning water and gas on and off, according to the manufacturer. Designed for use with any standard a.c.

transformer-type welder of 500 amperes or less, unit is housed in a 21x19x18½-in. steel case, weighing 125 pounds, and mounted on casters. Hobart Brothers Co., Hobart Square, Troy, Ohio.

•

Pneumatic Hammer

For chipping, scaling, chiseling, and grooving, "Big Bully" air hammer delivers 8000 blows per minute, claims its maker. Has ¾-in. piston, weighs 3 pounds. Full speed and power of operation are said to be obtainable on less than 7 c.f.m. at 90 p.s.i. Accessories are routing, scaling, or flat chisels; star drill; spoon-face chisel gouge. An 8-ft. length of air hose with couplings is standard equipment. Dept. 34, Superior Mfg. Co., 1302 Ontario St., Cleveland 13.

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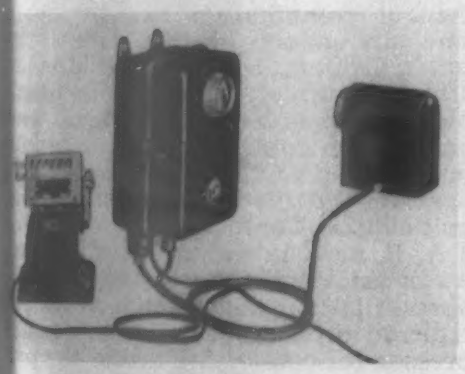

Photo-Electric Counter

General purpose Photo-Electric counter, Type 20AP5, for installation on conveyor systems or automatic machines, is designed for use in counting cases or bottles; freshly painted, hot, or small objects; for counting textile and leather piece goods; and for selective counting by height and length. The light source has an adjustable lens system which permits narrowing down the beam for use on very small objects. Photoswitch, Inc., 77 Broadway, Cambridge 42, Mass.

•

Floor and Wall Paint

Resistant to alkalis, acids, and other reagents, floor and wall paint, designated J-240, can be applied to metal, wood, concrete, or plaster. It is thinned with turpentine, and is said to offer good resistance to scrubbing

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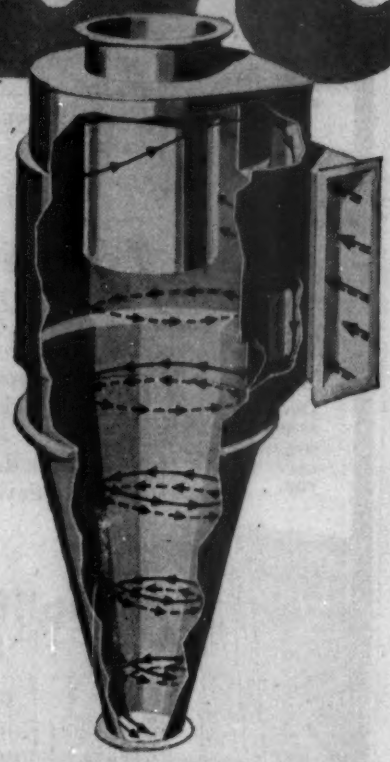
What to do about dust RECOVERY



Dollars to doughnuts

your attitude on dust collection and recovery is "Show me!" Because the Buell van Tongeren high-efficiency cyclone is so different its promise of better service on your job is important. *First*, only the van Tongeren System has the "Shave-off", which is the pay-off in achieving high fractional efficiencies. *Second*, each Buell unit is engineered to the job for which it is to be built. *Third*, size, shape and proportion give it not only a decided efficiency advantage but an assured freedom from plugging which is most important. The facts are marshalled for easy reading in a new 32 page catalog. Write to: Buell Engineering Company, 12 Cedar Street, New York 5, N. Y.

buell

Engineered Efficiency in DUST RECOVERY

and abrasion. Gordon Lacey Chemical Products Co., Inc., 57-02 48th St., Maspeth, N. Y.

•

Welder Control

For foot-operated spot, projection, and butt welders, non-synchronous control combination has the main line disconnect switch within the unit. Cabinet houses a NEMA 1A, 3B, or 5B timer, fusible or non-fusible disconnect switch, line fuses, and an ignitron contactor. Power supply unit is universal for all timers and operates on 208, 230, 380, 460, or 575-volt source. Contactor accommodates 2 A, B, or C tubes, includes internal water lines and connections, bus supports, thermal flow switch, fuses for ignitron protection, and a surge suppressor for connecting across the primary of the welding transformer. Five models, with over-all height from 48 to 60 inches, obtainable in floor, side-of-welder, or wall-mounting styles. Weltronic Co., 19452 West Eight Mile Rd., Detroit 19.

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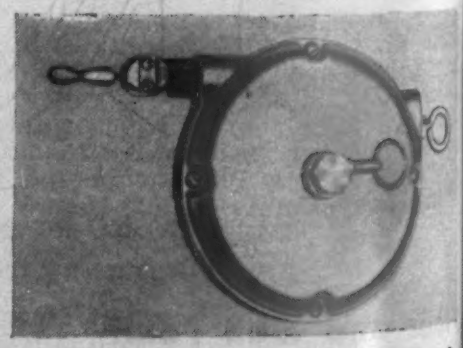

Self-Winding Reel for Tools

Self-winding reel that suspends portable tools such as pneumatic screwdrivers, nut runners, and drills, and raises them out of the way when not in use is known as the Zoo-Self Wind-

Specialized Service *to* INDUSTRY

Years ago Jeffrey realized that an efficient service to all industries was not possible without first establishing specialized engineering service to each individual industry. So Jeffrey departmentalized its engineering set-up . . to better solve the many problems arising out of the widening demand for the mechanical handling of all kinds of materials.

Today, Jeffrey service is specialized . . whether it's Construction, Sewage and Water Treatment, Steel, Foundry, Automotive, Food, Chemical, Power and General Manufacturing . . our engineers have studied the needs and requirements. Available throughout this country and abroad are Jeffrey Sales Offices and authorized Representatives. They stand ready to serve you.

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ESTABLISHED 1877

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Complete Line of Material Handling, Processing and Mining Equipment

PORTABLE TYPE

APPLETON REELITE

TRADE MARK

Appleton Portable Reelite solves the countless lighting problems of car-loading, machine-inspection, stock-keeping, maintenance work—any job that requires adequate lighting in out-of-the-way places.

Durable extension cord is paid out against spring tension by the Portable Reelite and is held at desired length by a ratchet stop. When light is not in use, cord is re-reeled — up and out of the way like a window shade. Jacketed with genuine DuPont Neoprene, cable is long-wearing and tough; resistant to oil heat, and acid fumes.

Put the Appleton Portable Reelite to work on your lighting problems soon. It pays its way in dependable performance, decreased extension cord costs, saved time and good lighting.

Sold Through Electrical Wholesalers

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SEND TODAY for Bulletin 217, describing Appleton Portable Reelites, special Reelites for power tools, and static discharge reels for grounding static charges during fueling operations; or see Sweet's File, page 2a/15.

APPLETON

CONDUIT FITTINGS • LIGHTING EQUIPMENT • OUTLET AND SWITCH BOXES
EXPLOSION-PROOF FITTINGS • REELITES

ing Balance Reel. Reel may be hung from beam or cable above the work area, and tool fastened to the end of the 6-ft. cable found on drum within a cast-aluminum housing. Operator merely pulls the tool down when he needs it. Tension nut and lock are located on reel housing for easy adjustment, and can be regulated to balance any tool up to 10 pounds. Aero-Motive Mfg. Co., 1803 Alcott St., Kalamazoo 24, Mich.

•

Protective Lock Fluid

Graphited lock fluid, called Lock-Ease, was developed to provide protection against lock failures caused by freezing, sticking, rust, or wear. The liquid, which contains a rust inhibitor, seeps into all parts of the lock mechanism, where the carrier fluid evaporates, leaving a graphite film, driving out moisture and flushing out grease and dirt. Colloidal graphite, when applied in this manner, is said to have a metal plating action. Said to be particularly useful in cold climates. Comes in 4-oz. controlled-flow cans, which deliver either a drop at a time or a pressure stream. American Grease Stick Co., Muskegon, Mich.

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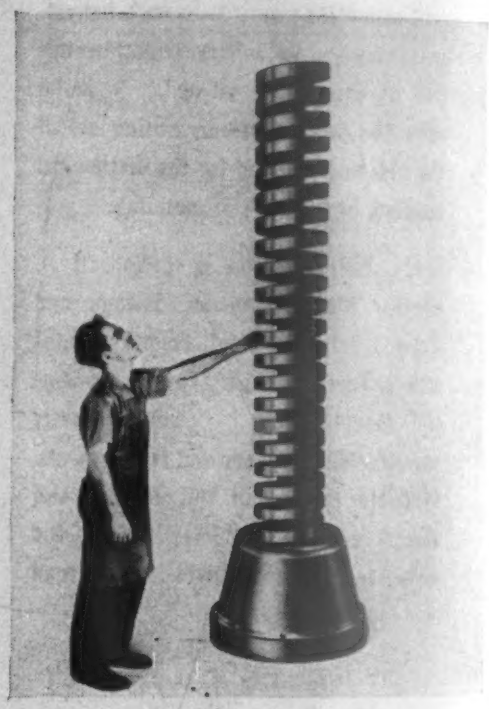

Vertical Spiral Feeders

Controlled highspeed vibration applied to a spiral elevating ramp elevates or lowers various types of bulk material without using buckets, sprockets, gears, chains, or motors. The material flows up and around the ramp at rates controllable by a rheostat or reactor provided with each unit. Available in limited heights and diameters. Maximum tonnage required determines the diameter of the ramp. Available for operation on 110, 220, or 440 volt, a.c. Syntron Co., 480 Lexington Ave., Homer City, Pa.

•

Bench Grinder

Six-inch utility bench grinder has a fully enclosed motor of the perma-

We take our own medicine

INDUSTRIAL REFRIGERATION for anodizing aluminum... air conditioning for precision assembly of small parts ... refrigeration for cooling of quench baths . . .

Month after month industry finds new ways to speed production, control quality through heat transfer equipment.

General Electric has pioneered in many of these fields, putting new processes to work in G. E.'s own factories. That's one reason why General Electric equipment is so well adapted to widely diversified industrial needs.

Ask your General Electric Contractor or Distributor for suggestions in applying heat transfer equipment to your industry. Or send the coupon for free General Electric Book.

Stratosphere Chamber—reproduces atmospheric conditions equivalent to 75,000 feet above sea level.

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12 G-E CM-124 Compressor Units run a battery of test cabinets, including the two pictured above.

℞ FOR TESTING ELECTRONIC MATERIALS

General Electric uses G-E refrigeration in one of its factories to put radio and electronic materials to rigid tests. Test cabinets that produce temperatures as low as −100 degrees F. require the high volumetric efficiency and proven reliability of General Electric Compressors to achieve the desired results day after day.

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"New Industrial Dimensions" describes 17 important applications . . . gives photos and diagrams of basic heat transfer methods.

General Electric Co.,
Air Conditioning Dept., Section A87210
Bloomfield, N. J.

Please send me FREE copy of the General Electric book "New Industrial Dimensions."

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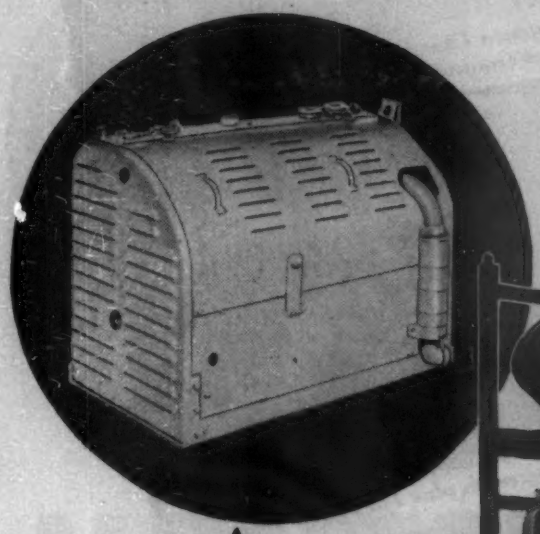
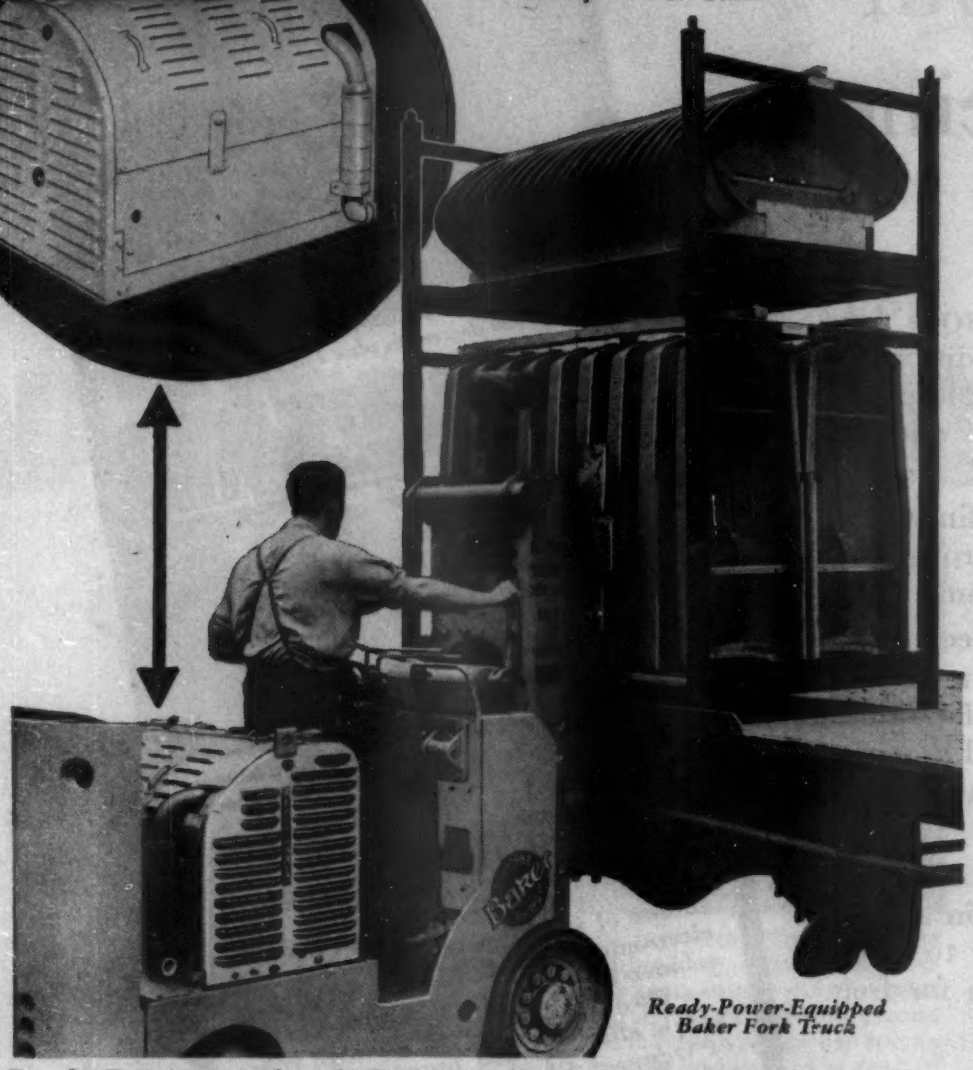
IT WILL PAY YOU TO CONVERT TO READY-POWER

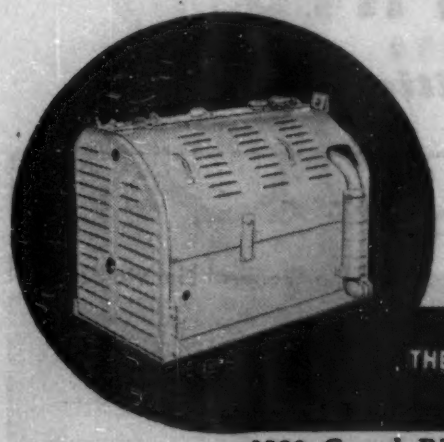


You can convert any electric industrial truck to gas-electric operation by installing a Ready-Power Unit.



Ready-Power-Equipped Baker Fork Truck

Ready-Power gas-electric Power Units are unequalled for completely dependable power, hour after hour, day after day. A Ready-Power Unit will be installed by an electric truck manufacturer on any new truck you order . . . but you don't have to wait for that because you can convert any electric truck you now have. Write The Ready-Power Co. today for complete information.



Ready-Power-Equipped Crescent Platform Truck

THE READY-POWER CO.

3820 Grand River Ave., Detroit 8, Michigan

nent split capacitor type. Standard equipment includes two 4-in. grinding wheels, fine and coarse, adjustable tool rests, and an abrasive wheel dresser. Also available are two 7-in. sander and grinder units for standard or heavy duty. K. O. Lee Co., Aberdeen, S. Dak.

•

Turbine-Type Pump

Designed for applications requiring pressures to 175 pounds, speeds to 3,600 r.p.m., capacities to 150 g.p.m., and viscosities to 550 s.s.u., turbine-type pump will handle liquids of extreme temperature variations without stalling, hot liquids without vapor-binding, according to manufacturer. Single multivaned impeller develops high pressures in single stage construction. Both heads and impeller, available in either bronze or stainless steel, are renewable. Roy E. Roth Co., Rock Island, Ill.

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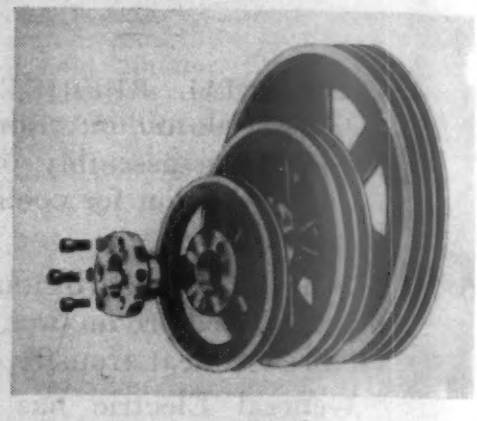

Interchangeable Hub Sheave

Use of "LD" sheave permits various diameter rims to be mounted on the same hub, and/or hubs of different bore to be mounted on the same size rim. Heat-treated socket head screws, held by lock washers, attach hub and rim together through template drilled holes in the rim web which allows interchangeability and quick mounting without special tools, states manufacturer. Smaller diameter sheaves utilize fillister head screws. Sheave rims are made from semi-steel castings. Available for drives servicing ½ to 10 horsepower, in 1, 2, and 3 grooves for "A" section belts, also in combination grooves for "A" and "B" section belts in sizes from 2.2-in. P.S. to 18.4 in. P. D. Transmission Machinery Corp., Box 7823, Dallas.

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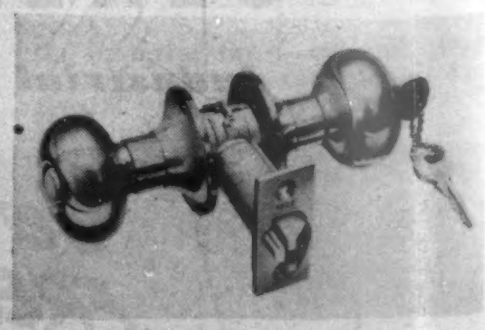


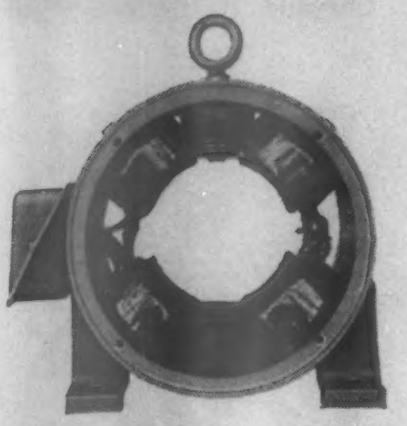
Tubular Locks

Line of 6-pin tumbler tubular locks designed to cut installation time, con-

Century Direct Current Motors

Correct Design, Rugged Construction Mean Long Life and Top Performance

Century 3 horsepower Direct Current open rated (1249A) ball bearing motor, equipped with protecting covers



1

Nearly 50 years of experience and know-how have gone into the development of modern Century Direct Current motors. From this background Century engineers have developed a complete line of DC motors from 1/6 to 300 horsepower — available for any application where direct current is used.

Typical applications are wire drawing machines, steel mill applications, machine tools, motion picture machines, marine equipment on shipboard, cranes and hoists, oil field equipment and applications requiring adjustable voltage speed control.

2

Here are some of the construction features that make them rugged, sturdy, dependable sources of electric power.

1. Rugged steel frame with accurate machining. Stays rigid, maintains proper air gap between field and armature. Windings are neat, compact, thoroughly saturated with insulating compound.
2. Armature is built upon a stiff steel shaft. Mica insulated commutator is large. Large fan assures adequate ventilation.
3. Strong, durable brass brush holder keeps brushes securely in position. Rugged construction contributes to long life. (Shown mounted on inside bearing cap.)
4. Illustration is of a splash proof end bracket assembly for ball bearing motor. Accurately machined to maintain shaft in alignment.

3

These and other features of Century Direct Current motors contribute to their long life of top performance.

4

In addition to DC motors, Century builds a complete line of electric motors and generators from 1/6 to 400 horsepower to meet the requirements of industrial and commercial applications.

Popular types and ratings are available from factory and branch office stocks.

Specify Century motors for all your electric power requirements.

CENTURY ELECTRIC CO. 1806 Pine St., St. Louis 3, Missouri

Offices and Stock Points in Principal Cities

Century C MOTORS

for HEAVY-DUTY and EASY HANDLING

it's MM MINNEAPOLIS-MOLINE MODERN MACHINERY INDUSTRIAL TRACTORS

The 27 H. P. RTI and the 49 H. P. UTI MM Industrial Tractor are modern material movers . . . masters of difficult material handling situations. Winches, cranes, loaders, pull-behind scrapers *quickly and economically* adapt the rugged MM wheel type Tractors to a wide variety of applications. 'V' type and reversible snow plows, rotary brooms, dozer blades, and MM side-mounted and pull-behind mowers adapt the MM for low-cost, efficient maintenance work. Cabs are also available for the protection of the operator.

Transport raw materials or finished products with cost-cutting, dependable MM Industrial Tractors that give year-around economical performance under the most severe conditions! Large diameter pneumatic wheels "cushion ride" heavy loads swiftly over all types of surfaces. Choice of two sizes to suit any job. Large load capacity front end and Ross steering assembly assure *EASY HANDLING* under all load and road conditions.

A complete line of MM Industrial Power Units from 25 H. P. to 230 H. P. offers economical power for all types of engine-driven equipment.

See your MM Dealer-Distributor or write

MINNEAPOLIS-MOLINE
POWER IMPLEMENT COMPANY
MINNEAPOLIS 1, MINNESOTA

tains 5 basic locksets, four with optional deadlocking bolt, making a total of nine different models. Manufacturer claims that after two holes are bored in the door, complete assembly can be made in 30 seconds. All models are uniform in appearance and interchangeable, designed to be reversible for last-minute changes in floor plans. Locks for outside doors have either plane long-throw latchbolts or are supplemented with deadlocking bolts. Locks for connecting doors have plain bolts only, and operate without a locking mechanism. Four other basic locksets having locking mechanisms in the knob, with key-in-knob feature said to simplify detail by eliminating outward screws on door faces and surplus plates. Yale & Towne Mfg. Co., Chrysler Bldg., New York 17.

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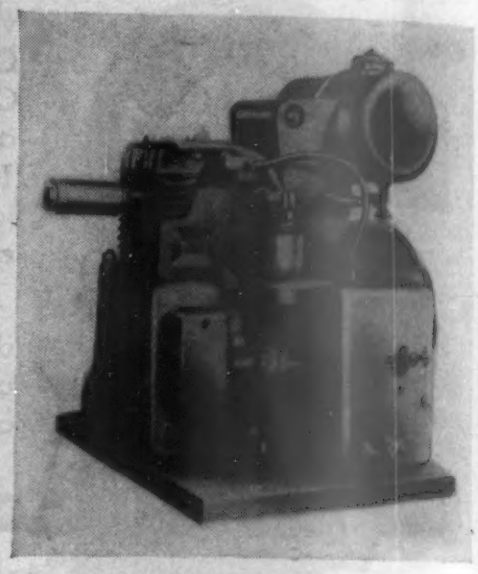

Small Electric Plant

Four-cycle, engine-driven lighting plant, Model AAE, generates 350 watts a.c. It weighs 77 pounds, and occupies less than 2 cubic feet. Available in 115 volt a.c. models and 6, 12, and 32 volt d.c. battery chargers in 300 and 400-watt capacities. All models have electric push-switch starting. D. W. Onan & Sons, Inc., 3620 Royalston Ave., Minneapolis 5.

•

Dry Reproduction Machine

Called the Super-B, dry reproduction machine produces prints at speeds up

New Sole Supplier!

Johansson Gage Blocks

now made for all Western Hemisphere by Brown & Sharpe

With the recent purchase of the Johansson Division from Ford Motor Company, Brown & Sharpe now acquires all rights to manufacture and distribute Johansson Gage Blocks and Accessories throughout the Western Hemisphere.

Thus, industry is assured a continuing, dependable source of supply for Johansson products of the same unprecedented precision that has made them the world-wide measuring standard in mass production of interchangeable parts.

The Brown & Sharpe name is industry's guarantee that the traditional precision of Johansson Gage Blocks and Accessories will be maintained without compromise. This world-famous name has symbolized leadership in the development and manufacture of precision measuring devices, machines and tools for more than 100 years. Brown & Sharpe Mfg. Co., Providence 1, R. I.

We urge buying through the Distributor

BROWN & SHARPE B·S

UNION PACIFIC

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To American Industry:

Washington is a fast growing state. We are extending our war-time gains and making great strides forward. People are hard at work building more dams, laying out new towns, preparing new land for farms.

The Columbia River is the greatest single source of electrical power in the world. With low-cost power, our wealth of natural resources, and our maritime trade with Alaska and the Orient we are establishing a regional economy unrivalled in the nation.

Enterprising business men will find here new and exciting industrial opportunities. These include processing of raw materials, fabrication of new products, diversified trades to service a growing city and farm population.

Washington State is a good place in which to live, to work, to do business and to prosper.

Governor

★*One of a series of advertisements based on industrial opportunities in the eleven states served by Union Pacific Railroad.*

Unite with Union Pacific in selecting sites and seeking new markets in California, Colorado, Idaho, Kansas, Montana, Nebraska, Nevada, Oregon, Utah, Washington, Wyoming.

★Address Industrial Department, Union Pacific Railroad
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UNION PACIFIC RAILROAD

Road of the Daily Streamliners

to 25 f.p.m. states the maker. Operation is continuous, with exposure and dry development combined in one automatic operation. Prints are produced in either roll or cut sheet form, without handling after exposure. Electronic speed control is said to provide changes in operating speed up to 25 f.p.m. May be adjusted for front or rear delivery of prints, and prints up to 12 inches wide and up to 42 inches long, may be front stacked in sequence. Ozalid, Div. of General Aniline & Film Co., Johnson City, N. Y.

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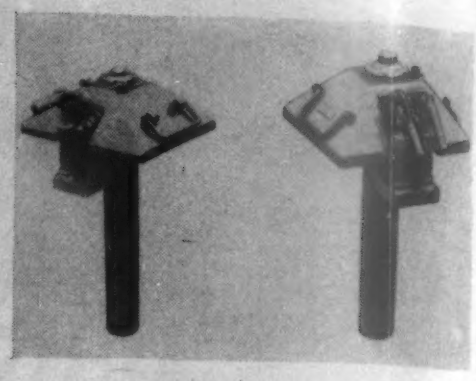

Hydraulic Jack

Two models of a hydraulic jack, 12 and 25 ton capacities, are made with a wide pyramid-shaped base, with the hydraulic cylinder extending below the cribbing which supports the jack. In the 25-ton model, working clearance is 6¾ inches, lifting range 16 inches. The jack operates either vertically or horizontally, is equipped with an air bleeder valve to eliminate "sponginess," and has automatic return. The 25-ton model employs two oil pressure pumps, the 12-ton a single pump. Curtis Jack Co., Seattle, Wash.

•

Vibration Dampner

For installation on suction and/or discharge sides of compressors, Fluor Pulsation dampner is designed to eliminate excessive vibration caused by pulsative flow through gas, air, or vapor lines. Device eliminates necessity for other mechanical vibration counteractors, according to manufacturer, eliminating vibrating floors and platforms, and permitting more accurate meter readings. Benson & Associates, Inc., 536 South Clark St., Chicago 5.

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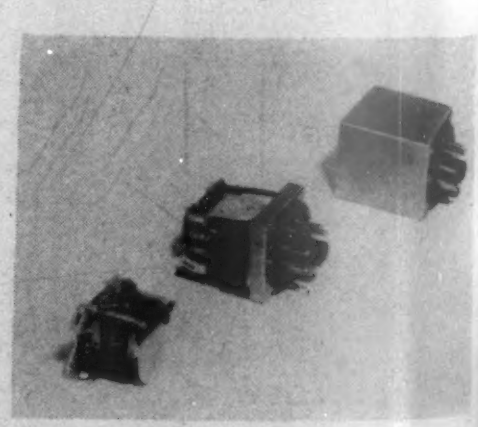

Control Relay

Operating on d.c. and a.c., as well as half-way rectified a.c., Type 118XBX

WRIGHT

"OVERHEAD" SHOWS A PROFIT

. . . when material handling is the problem

Here is a fast, economical way to cut material handling expenses—speed production. The new WRIGHT *Speedway* Electric Hoist is a rugged package of power with more exclusive features than any hoist in its class: grooved drum; full 12-foot lift with no overwinding; pre-formed wire rope with swaged fittings for anchoring; Timken tapered roller-bearing trolleys; standard NEMA motor frames and ratings . . . many others. Step-up production—reduce overhead with a new WRIGHT *Speedway*. Capacities from 250 to 2000 pounds. Get in touch with your Wright distributor today. Or write us at York, Pa., for folder DH-1250 for the whole story.

ACCO

York, Pa., Chicago, Denver, Los Angeles, San Francisco, Portland, New York, Bridgeport, Conn.

WRIGHT HOIST DIVISION
AMERICAN CHAIN & CABLE

HOISTS . . . TROLLEYS . . . CRANES

TRADE MARK

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See how you can CUT POWER COSTS at the... 18th NATIONAL POWER SHOW

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Over 300 outstanding technically-staffed exhibits and first-hand demonstrations of latest cost-saving equipment, materials and methods for steam, electric and mechanical power production and application — for economical materials handling — for efficient plant services — for expanding and modernizing power facilities. New cost-cutting ideas never were so important as now. So mark the date — plan to attend. See, learn and compare!

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All need a safe, cool water supply

An abundant supply of cool water is a convenience and a necessity in any plant! Workers, whether in office or shop, are refreshed, and production is kept at the peak! Halsey Taylor Coolers and Fountains come in types to suit your requirements. Ask for latest catalog. The Halsey W. Taylor Co., Warren, Ohio

F-5

HALSEY TAYLOR
Coolers & Fountains

control relay has double-pole double-throw contacts rated 2 amperes at 114 volts a.c. Normal d.c. operating power is 0.15 watt with maximum coil resistance of 2200 ohms. A.c. relays operate on about 9 volt-amperes with coils up to 115 volts, 60 cycles. Open type unit is 1½x1⅛x1-in. overall and weighs about 2 ounces. Can be housed in a 1⅜x1¾-in. enclosure and equipped with vacuum tube type of octal base. Also adaptable to hermetic sealing. Struthers-Dunn, Inc., 150 North 13th St., Philadelphia.

•

Mixing Unit

For use wherever soluble oils are required as a lubricant and coolant in machining operations, mixer, Model 6780, performs three operations simultaneously. It proportions water and soluble oil, mixes them into a uniform emulsion, and transfers the soluble oil from the original drum into another container ready to pour into the machine sump or circulating system. Unit is inserted into the bunghole of a drum of oil, connected by hose to a water outlet, and adjusted. Water pressure averaging 24 to 30 pounds per square inch is the only power required.

Supplied with a 2-in. pipe-thread sliding bung adapter for various heights of drums. Height is 40¾ inches; weight, 5½ pounds. Stewart-Warner Corp., 1826 Diversey Pkwy., Chicago 14.

•

Pneumatic Wrench

Pneumatic impact wrench, rated nominally for ⅜-in. bolts, is suitable, says maker, for nut running, reaming, tapping, stud-setting, and may be used as a drill. Tool is reversible, and, because its operation is based

Control IS THEIR JOB!

Count on G-E tube emergency tube service always near you; there compact, efficient thyratrons stay on the job.

Your G-E tube distributor or dealer stocks GL-502-A's and other types you may need to keep your welders, d-c motors, electronic heaters, and other tube-controlled equipment running full-time. Same-day—often same-hour—tube replacement service is yours on request. Take advantage of this convenient, speedy local supply source! Phone your G-E distributor or dealer today! If his name and number aren't readily at hand in the classified or general sections of your telephone directory, ask your G-E electronics office (see list below) to refer you to the G-E tube distributor or dealer nearest you. Or write direct to *Electronics Department, General Electric Company, Schenectady 5, New York.*

G-E electronics offices are located in the following cities:

ATLANTA 3, GEORGIA
187 Spring Street, N. W.
Phone. Walnut 9767

BOSTON 1, MASSACHUSETTS
140 Federal Street
Phone: Hubbard 1800

CHICAGO 54, ILLINOIS
Merchandise Mart
Phone: Whitehall 3915

CINCINNATI 2, OHIO
215 West Third Street
Phone: Parkway 3431

CLEVELAND 14, OHIO
710 Williamson Building
Euclid Ave. and Public Square
Phone Superior 6822

DALLAS 2, TEXAS
1801 North Lamar Street
Phone: Riverside 9121

DENVER 2, COLORADO
650 Seventeenth Street
Phone: Keystone 7171

KANSAS CITY 6, MISSOURI
106 West 14th Street
Phone: Victor 9745

LOS ANGELES 14, CALIFORNIA
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Phone: Madison 7381

NEW YORK 22, NEW YORK
570 Lexington Avenue
Phone: Wickersham 2-1311

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Phone: Pennypacker 9000

SALT LAKE CITY 9, UTAH
200 South Main Street
Phone: 4-1892

SAN FRANCISCO 6, CALIFORNIA
235 Montgomery Street
Phone: Douglas 3740

SEATTLE 11, WASHINGTON
710 Second Avenue
Phone: Main 7100

GL-502-A
Midget Metal Thyratron

Replaces Glass 2050 and 2051, though only half the size of either type.

CHARACTERISTICS

Max over-all height	2⅝ inches
Max over-all diameter	1 5/16 inches
No. of electrodes	4
Heater voltage	6.3 v
Heater current	0.6 amp
Ambient temperature limits	—55 to +90 C
Peak anode voltage, inverse	1,300 v
Peak anode current	1 amp
Avg anode current	100 ma

GENERAL ELECTRIC

161-GA32-8850

FIRST AND GREATEST NAME IN ELECTRONICS

RHOADS *Tannate* LEATHER BELTING

FASTER THAN
A MILE-A-MINUTE

This 36" TANNATE belt driving a compressor in a salt company has been running at 6100 fpm carrying a variable load of 600-800 HP for more than seven years, almost continuously. A prior TANNATE belt performed six years on the same job. Other leather belts ran less than two years.

Rhoads TANNATE leather belts are built for such service. They are carefully manufactured from the raw hide to the finished belt designed for the specific job. TANNATE belts combine:

Maximum grip with minimum tension. You get more power transmitted with less wear on the bearings and belt.

High overload capacity. Top speeds are maintained even at peak load.

Great flexibility. TANNATE will operate over small pulleys at high speed.

Resistant to moisture, mineral oils and many chemicals. TANNATE transmits full load even when damp.

If you would like to know how TANNATE belting can benefit you—write us.

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on impact, there are no springs or other fragile parts. Cleco Div., Reed Roller Bit Co., Box 2119, Houston.

•

Wheel

Designated the FDC 300, high-tensile steel wheel with full drop center rim, 4 by 8 (16-in. o.d.) pneumatic tire and separate tube has taper roller bearings and felt seal. Tire can be demounted without wheel removal from the axle. Grease tubes are furnished between disks to prevent the grease from reaching the tires. Taper dowels inserted in the disks maintain correct alignment. Geneva Metal Wheel Co., 300 Railroad St., Geneva, Ohio.

•

Corrosion-Resistant Pump

Twin-ramp heavy-duty pump, called Dura-flex, for use in pumping corrosive and erosive liquids, is built in three sizes, ⅜, 1/3, ¾ inch, with capacities from 1 to 20 g.p.m. It weighs 6½ pounds, is self-priming, with a speed range from 100 to 3,500 r.p.m. Available with or without outboard ball bearing. Manufacturer says it is built to specifications, provides pressures up to 65 p.s.i., will lift water up to 28 feet. May be used to pump salt water, abrasive liquids, coolant oils, vinegar, syrup, fuel oil, 24-D, and other liquids. Marine Products Co., 515 Lycaste, Detroit 14.

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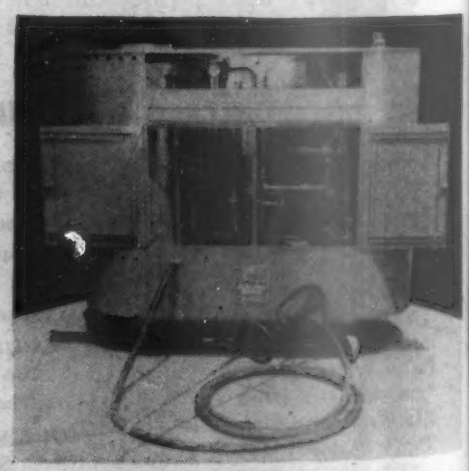
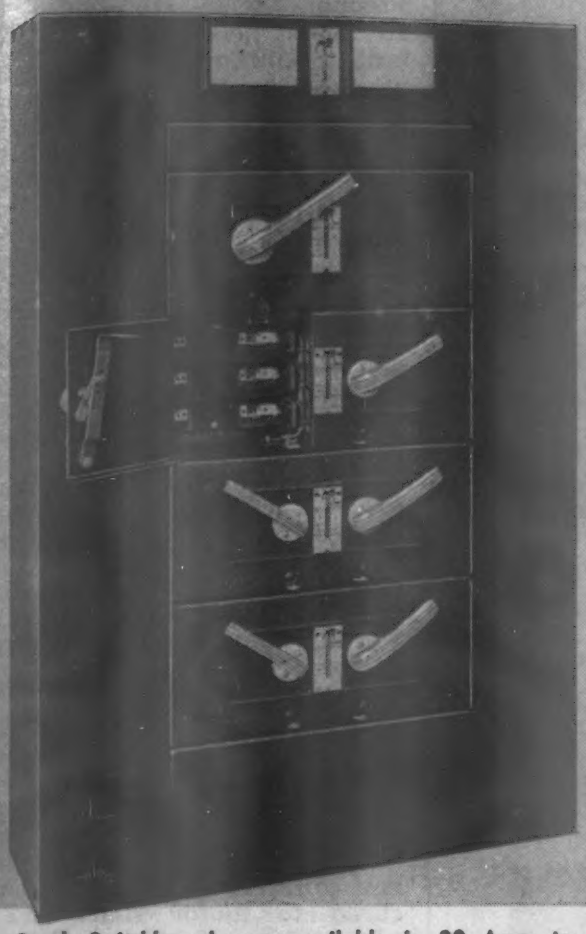


Steam Cleaner

Various models of the "Storm King" steam cleaner are available for operation on natural gas, manufactured gas, or oil, or for stationary, portable, or trailer use. Unit provides a choice of steam cleaning, utilizing 180 gallons of water per hour, or high pressure rinsing, utilizing 240 g.p.h. Pressure of 150 pounds is maintained for



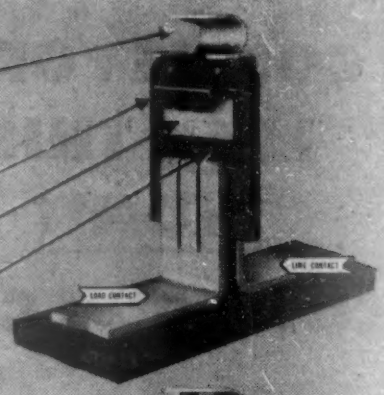
Vacu-Break Switchboards are available in 30 Amp. to 600 Amp., 2 & 3 pole circuits, 575 volts and less. BullDog manufactures Vacu-Break Safety Switches • SafToFuse Panelboards • Superba and Rocker Type Lighting Panels • Switchboards • Circuit Master Breakers • "Lo-X" Feeder BUStribution DUCT • "Plug-In" Type BUStribution DUCT • Universal Trol-E-Duct for flexible lighting • Industrial Trol-E-Duct for portable tools, cranes, hoists.

1 Switch head bracket attached to operating lever pushes the head (enclosing moving contacts) in and out on the stationary contacts.

Steel spring for pressure contact.

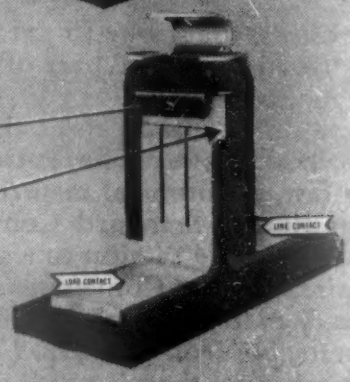
Moving contact (copper slug).

Close-fitting, partitioned arc chamber confines and snuffs out incipient arcing.

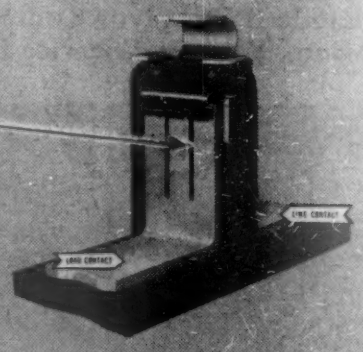


2 When operated to the OFF position, the Clampmatic spring accelerates upward (disconnect) action.

When operated to ON, the moving contact first engages the stationary contact prongs, before the spring moves down.



3 In full ON position, the moving contact fits tightly between stationary "line" and "load" contacts under full pressure by the Clampmatic spring.



Ever see a switchboard that's a quick-change artist?

ODDS are that sooner or later you'll want to add a new circuit, or remove an existing circuit or make a replacement in your electrical distribution system.

Such changes were once costly. But they're easily and economically made with the BullDog compact-type Vacu-Break Switchboard, a real artist for quick changes.

Vacu-Break Switchboards offer standardized switch units that are interchangeable and convertible. They can be added or removed easily, individually or in groups.

But flexibility isn't all. Here, too, is the valuable BullDog Vacu-Break principle of switching that smothers arcs instantly and safely before burning and pitting occur.

Self-aligning Clampmatic Contacts are tight as a bolted connection. They assure high conductivity, low heat losses, long life, minimum maintenance.

"Quick make" and "quick break" switch units in Vacu-Break Switchboards are horsepower rated, and can be used as operating switches as well as disconnect switches.

Don't put up with inefficient ganging of individual safety switches on makeshift racks. Contact your nearest BullDog Field Representative for more information about these remarkable Vacu-Break Switchboards.

BullDog's Field Engineers welcome the chance to sit in on planning stages of a building project. Their knowledge of electrical distribution layout can mean savings in installation and maintenance costs, as well as highest efficiency and reliability in actual operation. Why not take advantage of this pre-building service?

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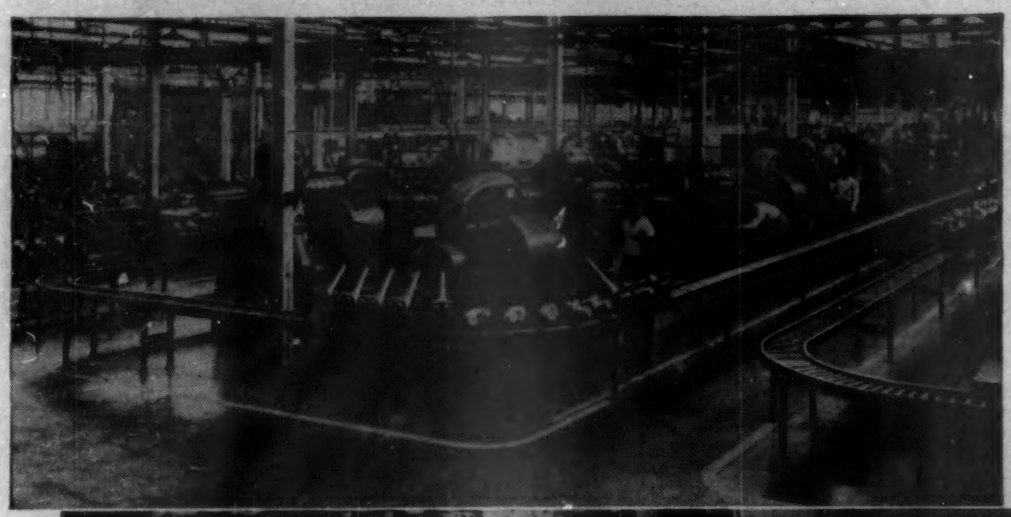

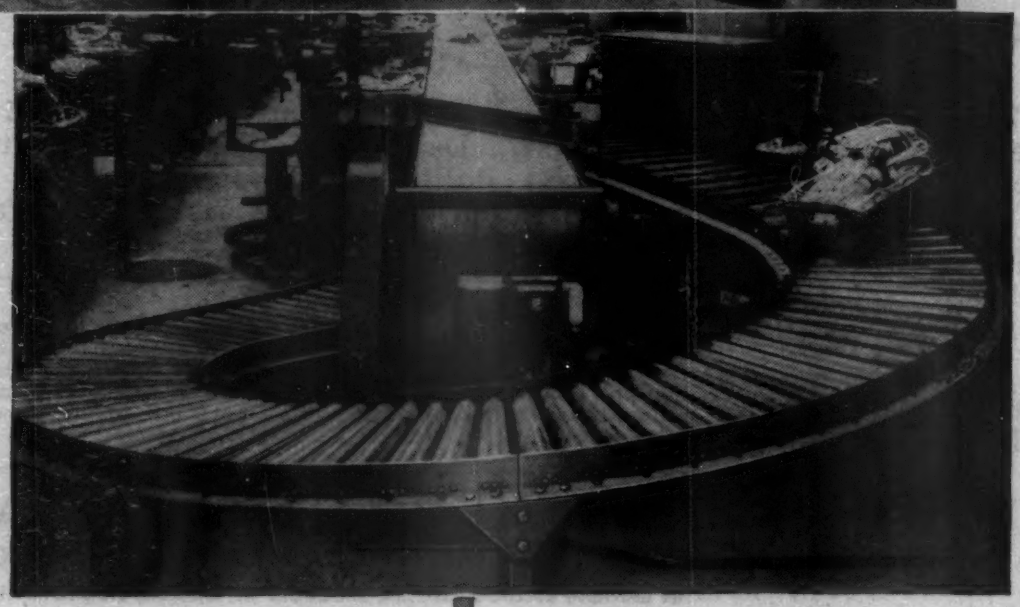

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Standard GRAVITY & POWER CONVEYORS

either operation. Manufacturer says that all working parts are easily accessible. A 64-gal graduated tank eliminates necessity for shutdown to refill. Solution strength may be varied according to cleaning needs with a fingertip control. Turco Products, Inc., 6135 South Central Ave., Los Angeles.

•

Steel Gate Valves

Line of union bonnet 600-lb. cast-steel gate valves, No. 3602XW and 3602X, replaces manufacturer's Nos. 3606XW and 3606X. New valves are available in sizes ¼ through 2 inches, with screwed ends and with two kinds of trim. Exelloy seats and hardened stainless-steel disk are features of the 3602W; 3602X has both seats and disk of Exelloy. Suitable for use with steam, water, air, gas, fuel oil, and other non-lubricating and relatively non-corrosive fluids. Crane Co., 836 South Michigan Ave., Chicago 5.

•

Circulating Pump

Vertical or horizontal installation of circulating pump is possible by means of four bolts, according to the manufacturer, who states that rubber coupling with brass inserts secured to motor shaft and pump eliminates vibration. Power supplied by 1/6-hp. single phase 60 cycle motor, supported by rubber shock absorber mounts. Available with either 1¼- or 1½-in. pipe. Jas. P. Marsh Corp., Heating Equipment Div., Skokie, Ill.

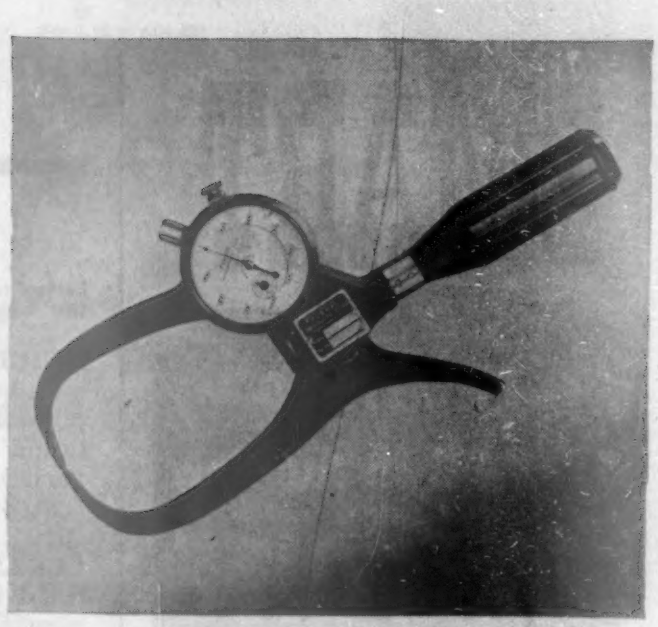
•

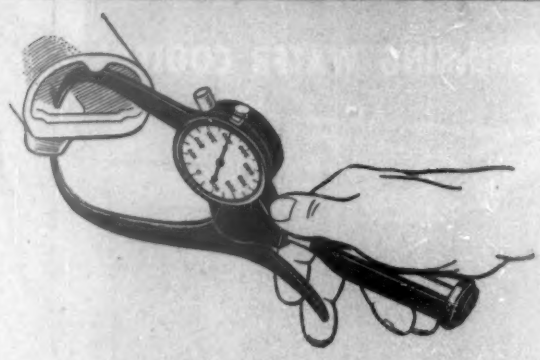
Rotary Pump

Designed to handle anything that can travel through a pipe, rotary pump transmits material either vertically or horizontally. As the rotor revolves, blades of the pump are carried under a hopper, loaded, and material is carried around to the discharge opening. There each blade is retracted into the rotor, where a plate scrapes material into the discharge opening, from which it is forced through the pipe or conduit. Roto-Flo Pump Corp., 249 North Water St., Milwaukee 2.

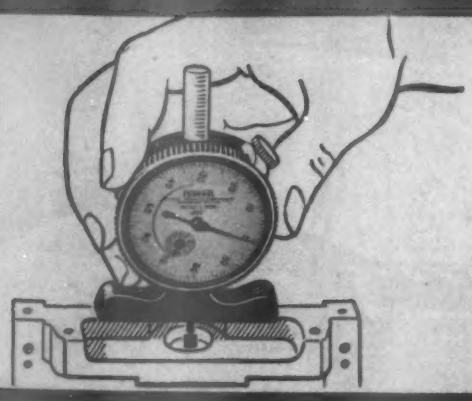
HERE—for example

THE DIAL INDICATOR
is used to check outside dimensions





This Caliper Type Indicating Gage checks outside dimensions faster and much more conveniently than old-style caliper gages. (Other models are made for inside dimensions.) Arm can be designed to your specific requirements, they permit measurement over, under or around all types of obstructions. You read the Dial Indicator and know at once if the dimension is right — or how far it varies from the specifications.



Another Application

THE DIAL INDICATOR
creates Depth Gages of greater accuracy

These Depth Gages provide a more positive, accurate and fast method of inspecting depths of holes, slots and other recesses. With old-style, conventional flush-pin gages you rely entirely on the sense of feel. Dial Indicator Depth Gages give you the exact measurement at a glance, show you whether the work is satisfactory or off-size — and exactly how much off-size. Special bases and points can be supplied to meet your particular requirements.

Write for illustrated Bulletin #55 to receive detailed descriptions of the above gages. Let us help you with any problem of gaging and inspection. If you will send us blueprints of work to be measured, we will gladly recommend the proper gage. No obligation is involved.

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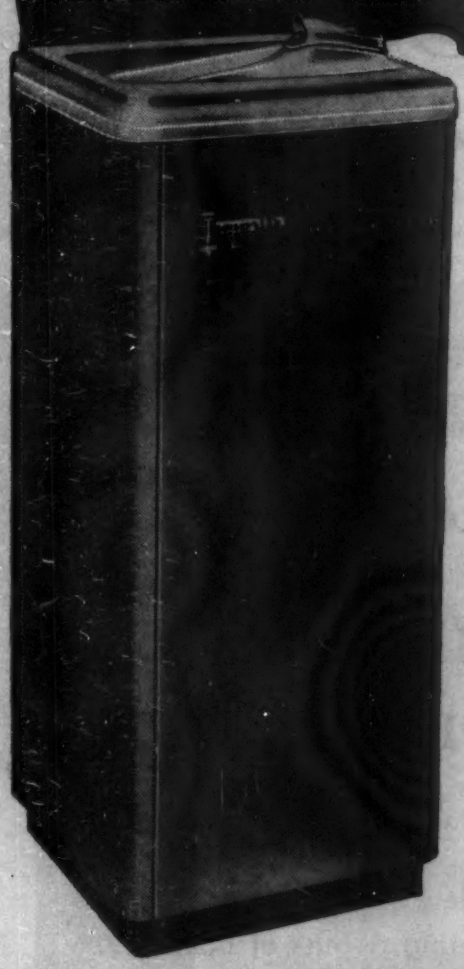

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more about the items on this page

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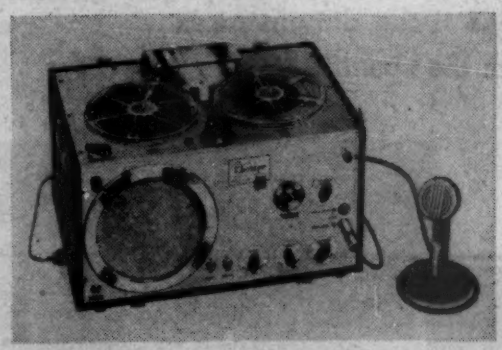
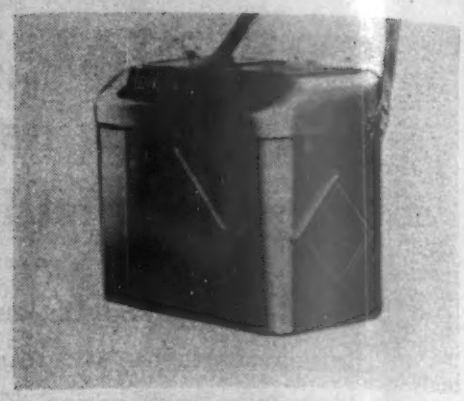


TAPE RECORDER. Ekotape has 8-in. speaker, oversize motor with high inertia flywheel. Volume indicator eye. Fast rewind. Time indicator scale. May be used as recorder, player, or public address system. Webster Electric Co., 1900 S. Clark St., Racine, Wis.



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BOOKLET. Contents of 399 Employee Magazines. Executives request on letterhead. Tables, illustrations. Discussion of contents by subjects. Index of companies mentioned. Policyholders Service Bureau, Metropolitan Life Insurance Co., 1 Madison Ave., New York 10.

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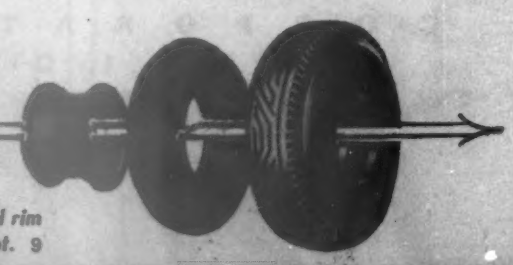

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properly cooled, pure drinking water. Typical plans for suggested installations. Refrigeration Equipment Manufacturers Association, 1107 Clark Bldg., Pittsburgh 22.

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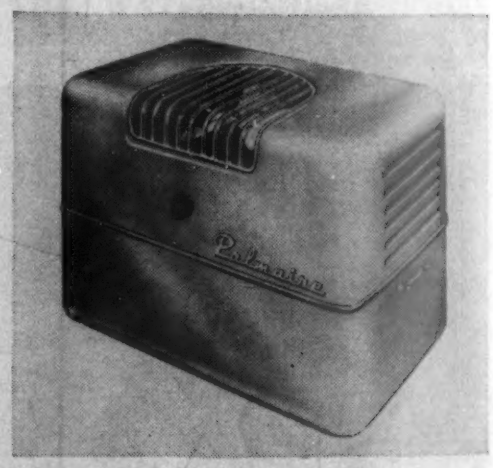

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How to Build Stronger, Lighter Levers at Less Cost

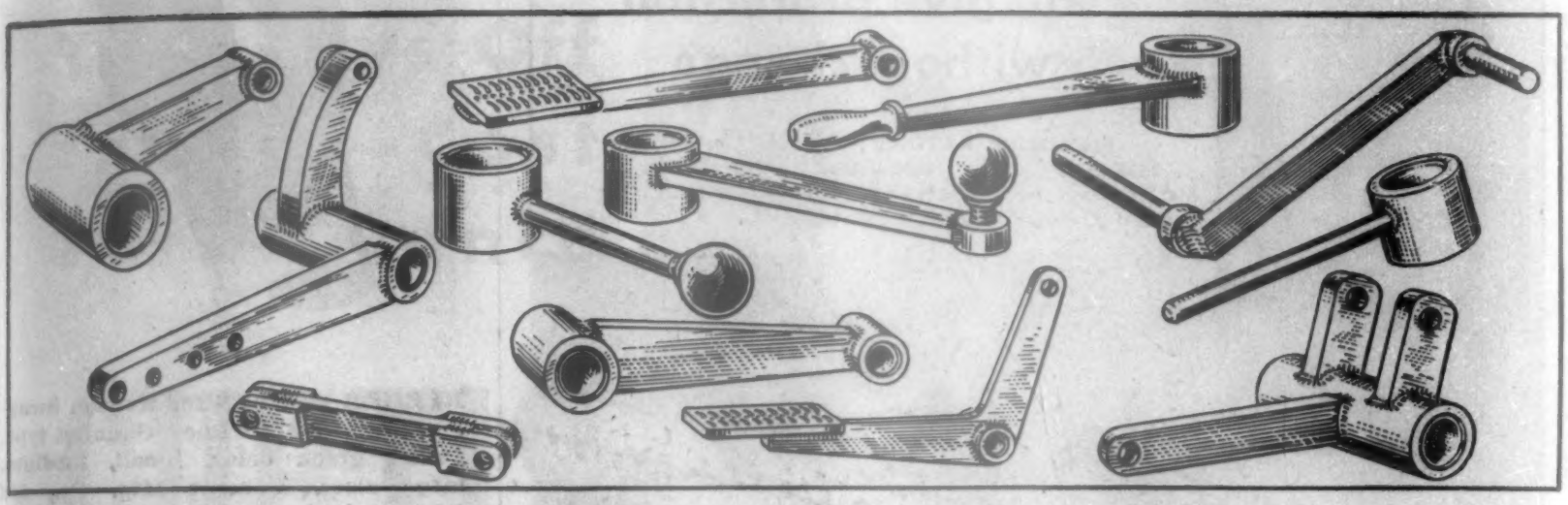

Fig. 1. Typical machinery operating levers that are being weld-fabricated at lower cost with arc welding.

ALL types of levers are being weld-fabricated in shops throughout the country, helping to produce stronger, lighter machinery construction with improved appearance . . . *all at less cost than with other methods.* Here is how these levers are built:

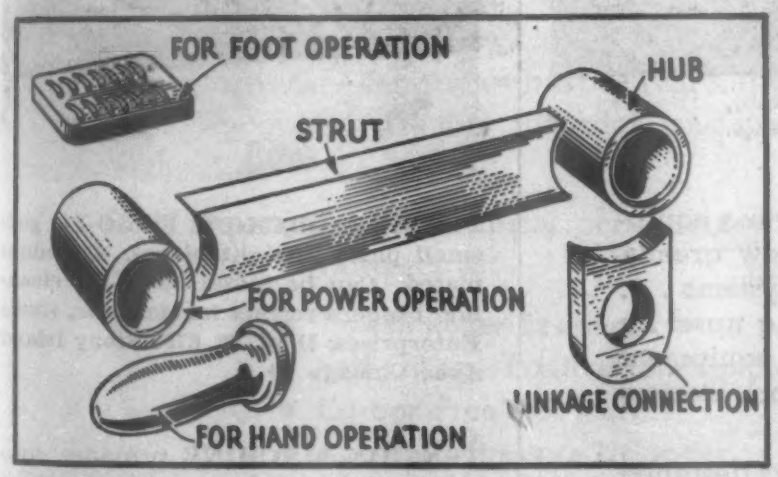

Fig. 2. Basic elements of levers for different types of operation.

More detailed data on the design of levers for arc welding is contained in the "Procedure Handbook of Arc Welding Design and Practice." Price $1.50 postpaid in the U. S. A.; elsewhere $2.00.

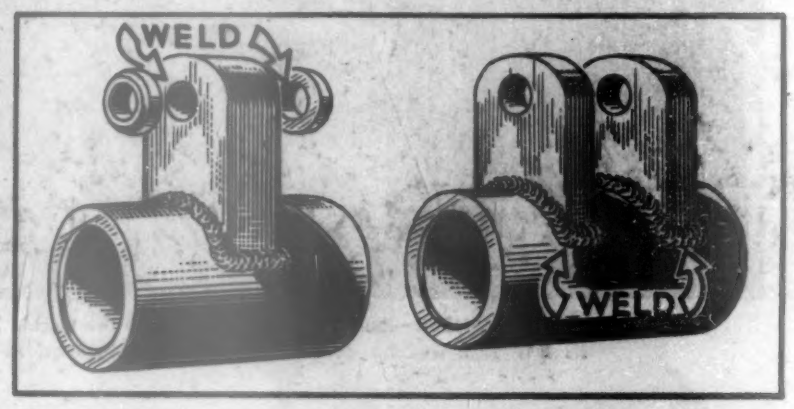

Fig. 3. Linkage connections for power take-off, made from steel straps.

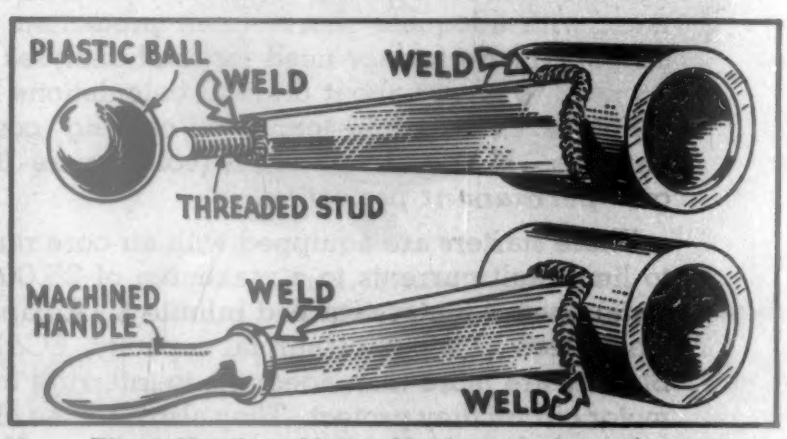

Fig. 4. Handles weld-assembled for manual operation.

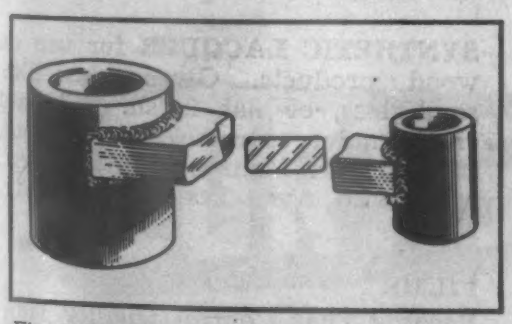

Fig. 5. Plain rectangular strut welded to hubs. For normal loads.

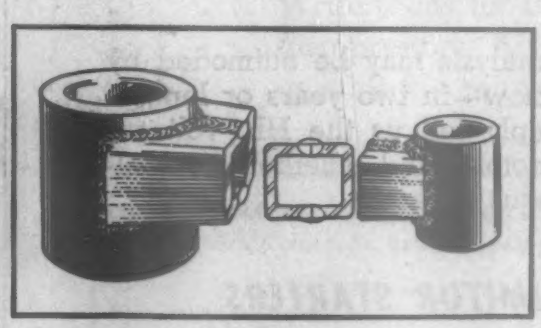

Fig. 6. "Box" section design strut for strong, light-weight construction.

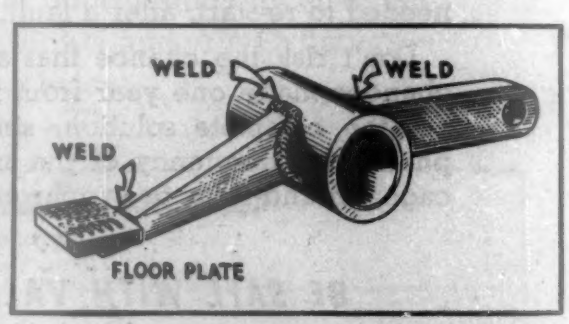

Fig. 7. Floor plate weld-attached for foot operation.

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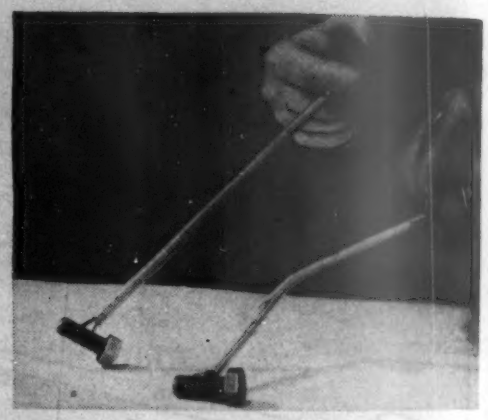

FLEXIBLE PICK-UP. Flex-O-Pic gets small parts in tight places. Cadmium plated. Can be taken apart for cleaning. Fingers retract inside cable. Emco Enterprises, Dept. 73, 6750 Stony Island Ave., Chicago 49

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SIGNIFICANT LABOR DEVELOPMENTS

BENJAMIN WERNE, Adjunct Professor of Industrial Relations, New York University and a Member of the New York Bar

Period Surveyed: August 1 to September 1

Trend Indicators

Wage Hour

BONUS INCLUDED IN REGULAR RATE

A bonus must be counted as part of the regular rate of pay where the employer arranged to grant it with regularity and the amount of the bonus may be ascertained by the application of a formula. Therefore, a regular incentive bonus was held part of the regular rate for the purposes of computing overtime. In so holding, the court pointed out that the formula for the computation of incentive bonus earning was fixed in advance and the employee could calculate his incentive earnings as soon as he completed a job.

Likewise, an attendance bonus paid to workers for faithful attendance during the scheduled work week and a production incentive bonus paid for the completion of a specified quota must be included in the basic hourly rate for calculating overtime. (Butane Equipment Company, Decision of Secretary of Labor under Public Contracts Act)

GOOD FAITH DEFENSE NOT APPLICABLE

The good faith defense under Section 9 of the Portal-to-Portal Act was held not applicable where the employer relied on the advice of inspectors of the Wage and Hour Division, since the advice of the inspectors was inconsistent with the uniform and well-publicized interpretations and ruling made by the Administrator himself. (Burke v. Mesta Machine Company, USDC W. Pa.)

LUNCH PERIOD NOT COMPENSABLE

Employees were not entitled to pay for time spent during a 30-min. lunch period, since the collective bargaining contract provided for a 30-min. lunch period on the employees' own time. In addition to the fact that the contract was specific and contained an express provision making lunch time non-compensable, the employees were never before paid by the company for their lunch periods and the work performed during the lunch period was not performed under a custom or practice. Despite the fact that the employees remained at their places of duty and occasionally rendered services to the employer during lunch periods, these services were voluntary, not called for by their contract, and therefore not compensable either by contract, custom, or practice. (Tully v. Joshua Hendy Corporation, USDC S. Calif.)

OVERTIME AGREEMENT HELD INVALID

An employer may not enter into an agreement with a union creating overtime payments which do not meet the statutory requirements. Therefore, an agreement entered into, wherein the employer agreed to add 10 per cent to piecework rates to compensate for overtime work and for other purposes, was held to be invalid. This additional 10 per cent payment may not be credited to statutory overtime pay, since it was not related to the number of overtime hours worked and an overtime premium, as was pointed out in the Bay Ridge Operating Company case, "is that extra pay for work because of previous work for a specified number of hours in the work week or day." Although the company and the union called the 10 per cent additional overtime pay, such a label failed to make it overtime compensation. (Garfunkel Makers, Decision of Hearing Examiner Under Public Contracts Act)

Similarly, a guaranteed wage plan was held invalid, where it could not be proved that the agreement was anything more than a plan to facilitate bookkeeping and the employees never accepted or understood the plan. The record showed that employees were hired at fixed monthly or weekly salaries to be paid regardless of the number of hours worked, that there was no agreement for an hourly rate of pay or that their salaries included overtime compensation for a fixed work week. Although the payroll records showed a breakdown of the amount paid into straight time and overtime based on a work week of a fixed number of hours which the employees allegedly worked, the trial examiner held that these payroll entries were "unilateral in character and ineffective to bring into being a valid contract for the payment of the required overtime." (Plywood Plastics Corporation, Decision of Administrator Under Public Contracts Act)

Labor-Management Relations

*HIRING HALL ILLEGAL

Where a union struck in an effort to force an employer to continue the hiring hall, it was guilty of causing

* In this classification, items marked with an asterisk also are considered to be trend indicators.

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LABOR DEVELOPMENTS *(continued)*

or attempting to cause the employer to discriminate against employees "in regard to hire or tenure of employment . . ." and thus violate Section 8(a) (3) of the Labor-Management Relations Act. Under a hiring hall provision, the employer is required to hire only such persons as are supplied by the union unless the union is unable to provide the needed replacements. The board found that in the operation of hiring halls, the union discriminated against non-members and that it was intended that such discrimination would continue if the hiring hall provision was included in the 1948 agreement. While, under a hiring hall, non-members could be admitted, they could only be assigned to job vacancies if no union member was available and ready to take over the job. A non-union member who was assigned a job was given a "trip card" and he could be bumped by any union member who was available and desired the job. The board held that, without any doubt, the hiring hall in practice has involved discrimination in violation of the Act, which as now amended no longer permits employers to discriminate against employees who are not members of labor organizations, except pursuant to a union-shop agreement under certain specified conditions. (In re National Maritime Union of America, NLRB)

***EMPLOYER'S TALK CONSTITUTED FREE SPEECH**

An employer is permitted to tell an employee that it would not be beneficial for him to join the union, notwithstanding the statutory right of employees to the freedom of self-orgahization, provided he also makes it plain that the employee has a free choice without any fear of discrimination. (NLRB v. Enid Cooperative Creamery, CCA 10)

EMPLOYER PERMITTED TO TRANSFER SUPERVISORY DUTIES TO WORKING FOREMAN

A contract authorizing management to select, assign, and direct the working force and to promote and transfer employees was interpreted to allow an employer to transfer the supervisory duties of a working foreman within the bargaining unit to a newly created supervisor's job outside the union. (In re arbitration between Drug Products Company, Inc., and Textile Workers Union of America)

***MANAGEMENT MAY ASSIGN UNEXPECTED OVERTIME TO EMPLOYEES WORKING**

Although the contract required the equal distribution of overtime "among employees within the department who can perform the work," an employer was privileged to assign unexpected overtime work (unloading) to employees in the stock department who were working on that day instead of having to call in employees in the department which normally handles unloading work. Management was not guilty of violating the collective contract,

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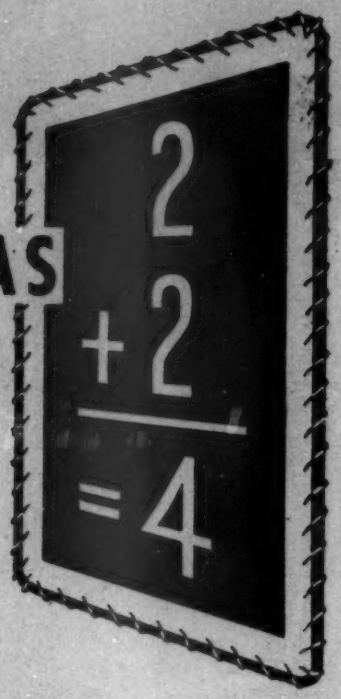

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since the employees who did the unloading received the overtime rates therefor. (In re arbitration between Portable Products Corp. and International Association of Machinists)

***HOLIDAY PAY DUE EMPLOYEES ON TEMPORARY LAYOFF**

Holiday pay was due employees even though they were on a temporary layoff during the holiday season. The employer cannot contend that laid-off workers are not "employees" and therefore not entitled to holiday pay, since the grant of holiday pay in the contract is unqualified and workers laid off temporarily do not cease to be "employees." (In re arbitration between Grinnell Lithographic Company Inc., and Playthings, Jewelry and Novelty Workers International Union, July 19, 1948)

***EMPLOYEES IMPROPERLY DENIED HOLIDAY PAY**

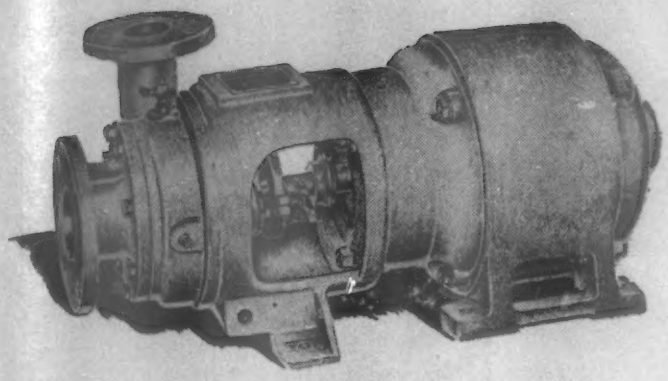
Employees were wrongfully denied holiday pay where they refused to work the regularly scheduled overtime day immediately preceding a holiday, since the contract only conditioned eligibility for holiday pay upon the employees having the "working day" before or after the holiday. The arbitrator held the denial as improper since many of the workers involved had been permitted not to work overtime days. Furthermore, the arbitrator pointed out, "the company and the union have never negotiated the question whether the term 'working day' in the holiday clause encompasses 'overtime' days." (In re arbitration between Lonsdale Company and Textile Workers Union of America)

***PENDENCY OF UNFAIR LABOR PRACTICE CHARGES DOES NOT PRECLUDE AN ELECTION**

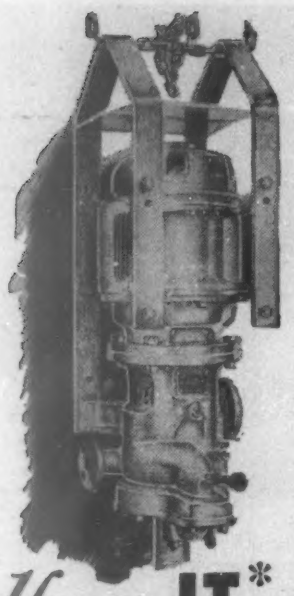
Despite the fact that unfair labor charges are pending against an employer, the National Labor Relations Board may still order a representation election. The employer cannot claim that the petition for an election should be dismissed, since it would not be equitable to allow an employer to make its own alleged misconduct the basis for dismissing the proceeding. (Stokely Foods, Inc., and Amalgamated Meat Cutters & Butcher Workmen of North America, NLRB)

***PROPER SUBJECT FOR BARGAINING MAY NOT LATER BE HANDLED UNILATERALLY**

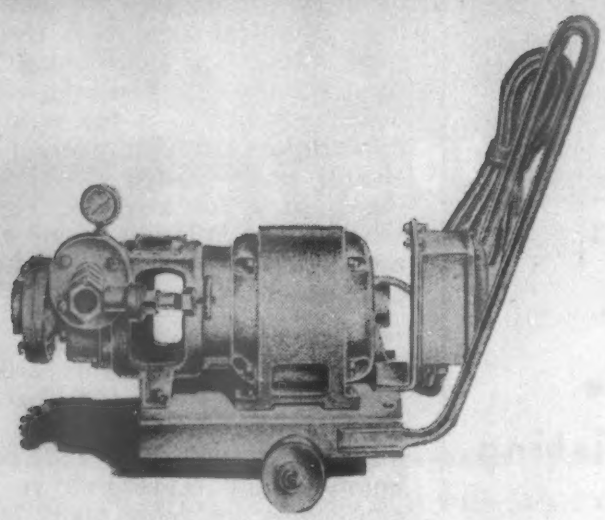
Where the employer treated a matter, which was a management prerogative, as a proper subject for collective bargaining and reached a settlement thereon with the union, he does not have the right later on to repudiate the settlement thus made. The arbitrator pointed out that after the written notice setting forth the agreement, the employer's association stood mute and "its failure then to assert on behalf of the company the right reserved to the latter by the contract precludes it from belatedly doing so after the bargain



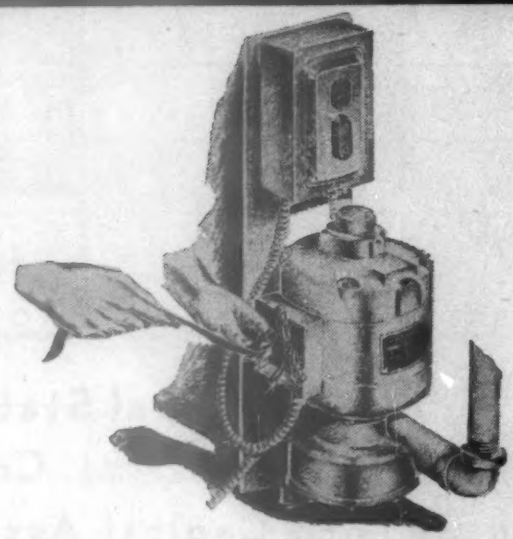
Set **IT*** *down*



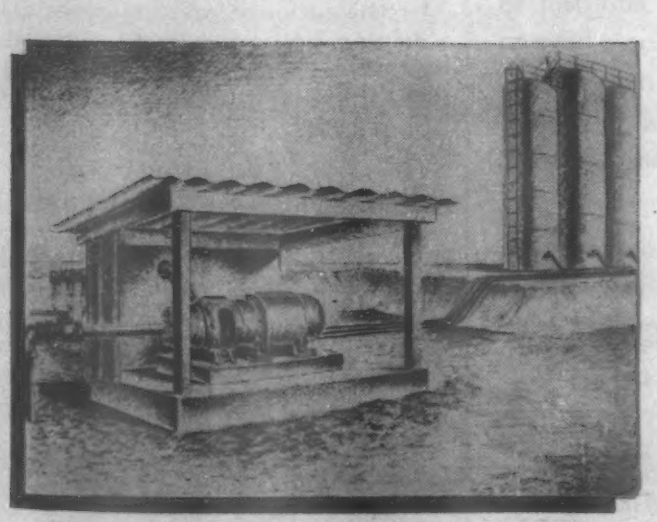
Hang **IT*** *up*



Push **IT*** *around*



Connect **IT***



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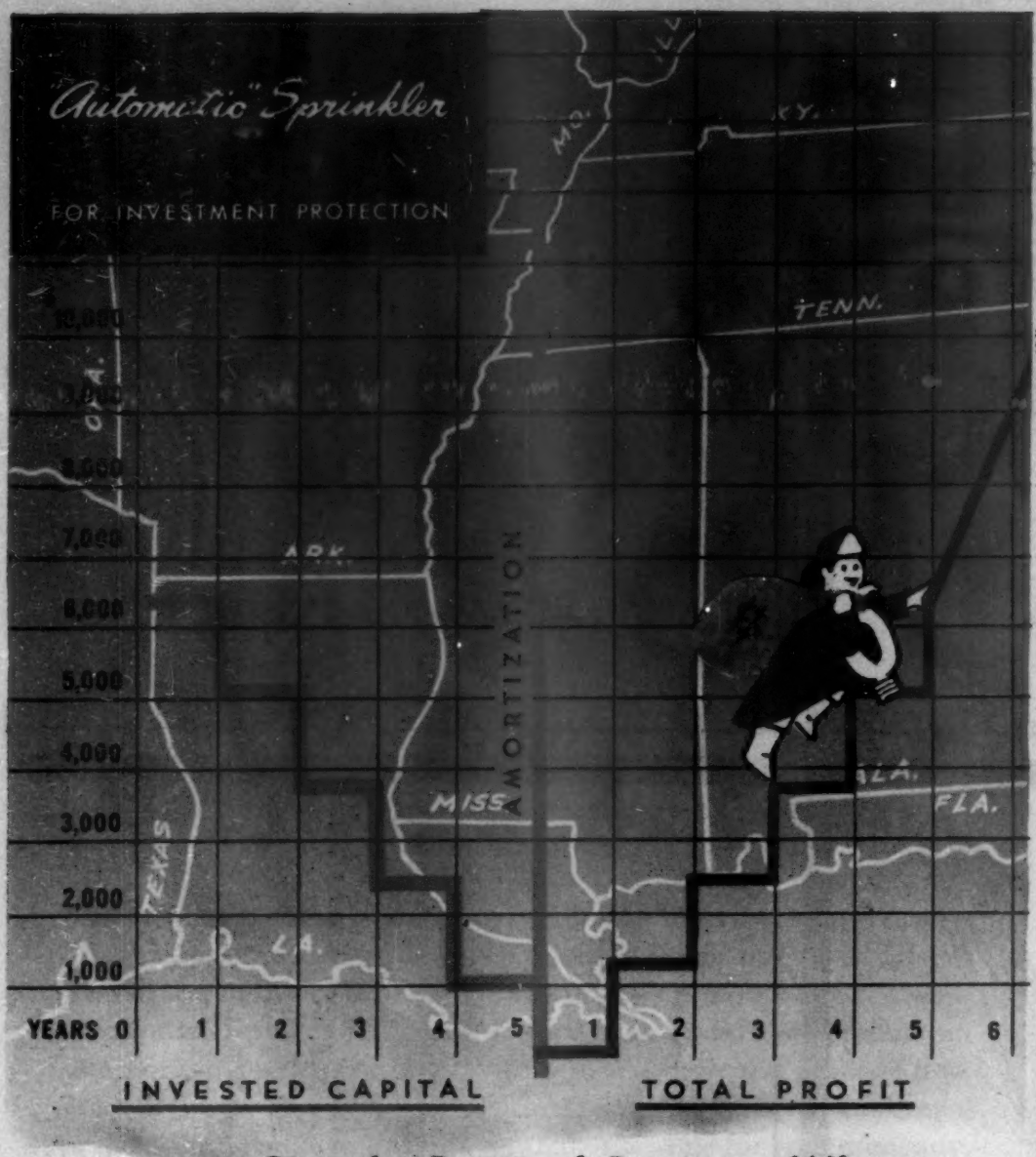

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which it tacitly approved has been carried out for so long a time." (In re arbitration between Pacific American Shipowners Association and Pacific Coast Marine Firemen, Oilers, Watertenders & Wipers Association)

***REFUSAL TO CROSS A PICKET LINE HELD VIOLATION OF CONTRACT**

Where the contract provided that it shall not be applicable to plant guards and contained a no-strike clause, the union was guilty of violating the contract where it refused to work because it was necessary for employees to pass through a picket line of plant guards. Although an individual union member has the right to refuse to work, he is not entitled to induce others to do likewise and thereby violate the collective contract. The union cannot defend the action taken by its membership on the basis that it is an implied term of the contract that its members may refuse to work if it is necessary for them to pass through a picket line. "If the union at the time it signed the contract wished to have reserved to it the right to refuse to pass through a picket line, it should have incorporated that express provision in the contract." (Freuhauf Trailer Company v. International Union-UAW, Calif. Sup. Ct., Los Angeles County)

***PEACEFUL PICKETING PERMITTED**

While the Florida Anti-Strike Act bars any strike not authorized by a majority of the employees, union members were allowed to picket a laundry, not representative of the employees, carrying signs inducing the employees of the laundry to strike. The court refused an injunction to the employer in this case, holding that the Florida statute was not applicable here, since there was no strike, walkout, or cessation of work being engaged in by the "employees" of the laundry. All that was involved was peaceful picketing by the union representatives and the display of handbills to persuade the employees to join their union. (Whitehead v. Miami Laundry Company, Fla. Sup. Ct.)

***TIME-STUDY MEN NOT SUPERVISORS**

Time-study men were held not to be supervisors as the category is defined in Section 2(11) of the Labor-Management Relations Act. While time-study men are "highly important technical employees in whom the company places considerable trust and confidence and upon whose judgment it relies, they are not managerial or confidential employees." The board pointed out that these time-study men have no authority to "reward" other employees or effectively to recommend such action, nor can they adjust the grievances of their fellow-employees. The findings of the board revealed that these employees failed to participate in nego-

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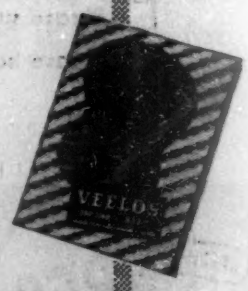

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LABOR DEVELOPMENTS (continued)

tiations leading to the adjustment of grievances, but only that they gave expert testimony at hearings held on grievances by representatives of higher management. (NLRB v. Brown & Sharpe Manufacturing Company, CCA 1)

EMPLOYEES HELD TO BE SUPERVISORS

An employee whose duties consisted of showing the men their jobs and seeing that the work was done, hiring and discharging employees, selecting the men for layoff by seniority and conveying notices to the men, disposing of complaints and grievances—was held to be a supervisor. The fact that the employee received these additional responsibilities recently and that he was awarded a wage increase therefor shortly before a board election, was immaterial, since at the time of the hearing, the employee did possess supervisory powers. (Royal Tallow & Soap Company Inc., and Teamsters, Chauffeurs, Warehousemen & Helpers, NLRB)

***SCOPE OF ARBITRABLE ISSUES LIMITED**

Where the contract limits arbitration to grievances involving "the meaning and application of the provisions of this agreement," the union cannot claim that grievances falling outside of the contractual scope are arbitrable. (In re arbitration between Bethlehem Steel Company and United Steelworkers of America)

***ARBITRATION NOT LIMITED TO QUESTIONS TREATED BY CONTRACT**

Where the agreement entered into by the parties provided for the submission of "any dispute" to arbitration, arbitrable questions are not limited to those treated by the contract. Therefore, as long as the dispute arose during the terms of the agreement, it was held to be a proper matter for arbitration. (In re arbitration between Defiance Button Company and Wholesale & Warehouse Workers Union, N. Y. Sup. Ct. Spec. Term, Part 1)

EMPLOYEES ENTITLED TO REPORT TIME

Second-shift employees who had not been notified not to report were entitled to receive 2 hours' report pay, despite the fact that the non-availability of work was caused by a work stoppage of first-shift workers. The contract specifically indicated that the employer could only escape liability for call-in pay by notifying employees not to come in, which he did not do in the instant case. (In re arbitration between Bay City Shovels, Inc., and United Steelworkers of America)

***EMPLOYEES ENTITLED TO REPORT TIME AT PREMIUM RATE**

Under a contract which required 2 hours' report time pay for employees who were called in but not given work and double time for the seventh consecutive day worked, an employee who was called in but not

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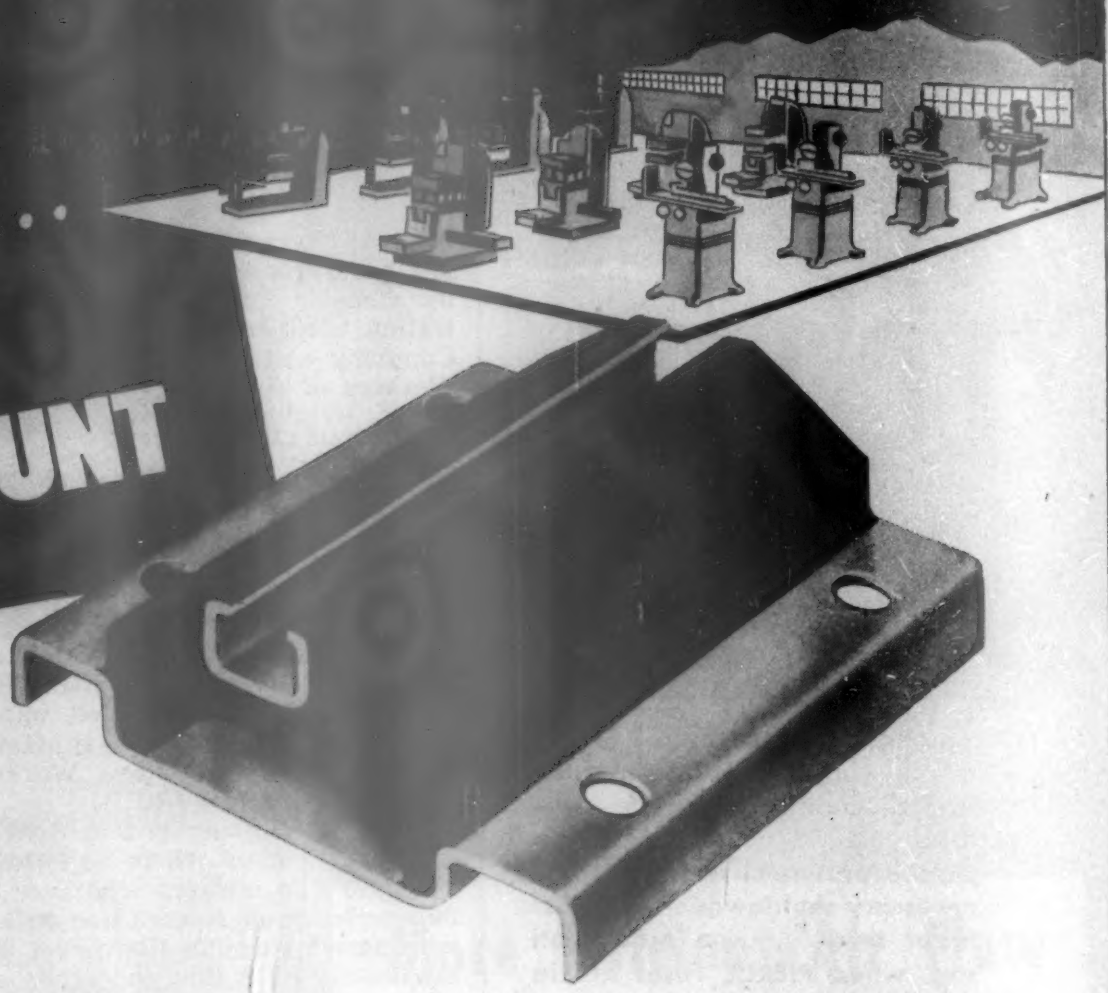

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LORD

Vibration Control

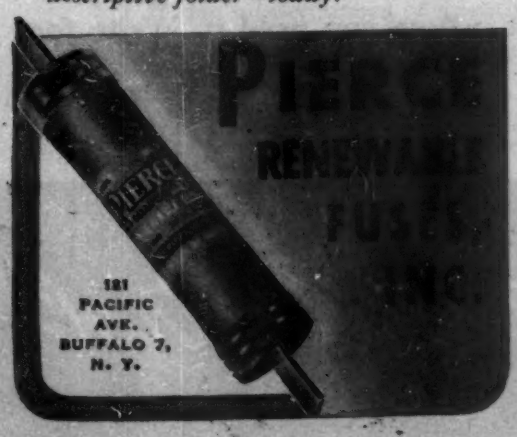
Through a close control of the current surge which results from low or momentary high overload, PIERCE Fuses keep your production line humming. No unnecessary shutdowns . . . no lost labor time . . . no production sag, when PIERCE Fuses are in your plant!

Here's how PIERCE Fuses produce cost-saving Surge Control:

BALANCED LAG LINK — creates more lag at low overloads — where it is necessary and harmless; gives **Safe** lag at high overloads.

SCREEN VENTILATION —takes in cool air and allows escape of heat and gases, reducing unnecessary fuse blowing and banishing dangerous "afterblow".

GET THE FULL STORY of the cost-saving Surge Control features of Pierce Renewable Fuses. Write for descriptive folder--today!



LABOR DEVELOPMENTS *(continued)*

assigned work on what would have been his seventh consecutive day of work is entitled to receive two hours' report time pay at the double-time rate. (In re arbitration between Saratoga Victory Mills and Textile Workers Union of America)

***EMPLOYER HELD TO HAVE VIOLATED SENIORITY CLAUSE**

Where seniority is established on a plant-wide basis, an employer was under obligation to offer an employee, who failed to meet the standards for his current job, an opportunity to transfer to a less difficult job if one was available and not held by a senior employee. (In re arbitration between Utah Ice & Storage Company and United Packinghouse Workers of America)

***HELD UNFAIR LABOR PRACTICES**

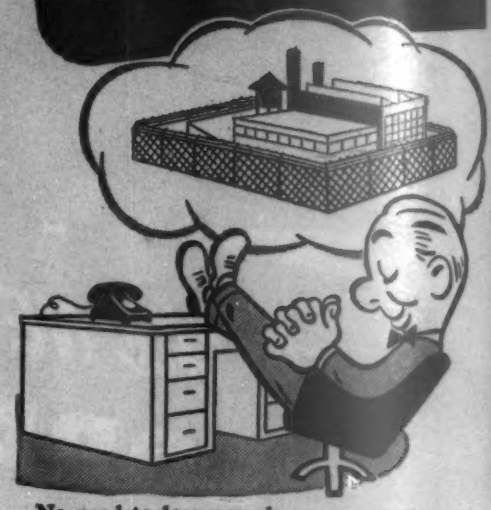
By ordering an employee to keep him informed about union matters, an employer was guilty of unlawfully watching organizational activities. In addition, the employer's questioning of other employees concerning their union activities and threatening to close the plant if it were organized, constituted unlawful interference. (Boss Manufacturing Company and Glove Workers' Union of America, NLRB)

An employer engaged in discriminatory treatment where he failed to reinstate two strikers who used offensive language toward non-strikers who passed through the picket line, despite the fact that the other employees refused to work with them because of their conduct during the strike. Said the board, "The language of the two striking employees, while intemperate and ill advised, must be regarded as an integral and inseparable part of their concerted activity, for which the Act affords them protection. . . . It is well established that the discharge of, or failure to reinstate, employees because other employees have ejected them from the plant or refused to work with them because of their membership in or activities on behalf of unions, is discriminatory, and that it is the duty of an employer to resist domination of its right and power to employ whether manifested by or toward a union." (Wytheville Knitting Mills, Inc., and American Federation of Hosiery Workers, NLRB)

***SUCCESSOR COMPANY LIABLE FOR UNFAIR LABOR PRACTICES**

Where an employer took over the business of another with knowledge of an existing unfair labor practice and continued to operate the business without any significant change in labor policy, the board held that the new company must be held to have assumed the obligation of remedying these unfair labor practices. (Alexander Milburn Company and United Electrical, Radio & Machine Workers of America, NLRB)

You can relax when your property is fenced by STEWART



No need to lose any sleep over vandals molesting your industrial property when it's surrounded by a Stewart Chain Link Wire Fence. The All Beam construction of the Stewart fence framework makes it the heaviest and strongest chain link wire fence manufactured. A Stewart Fence will give you the utmost in protection, and many years of dependable, low cost service. Write for Catalog No. 83.

THE STEWART IRON WORKS CO., INC.,
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Experts in Metal Fabrications since 1886

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Jigs, Fixtures, Machine Parts to Your Order

OUR EXPERIENCE Saves you money -Assures Precision Work

Since 1919 the BUERK TOOL WORKS has been turning out quality machine work on jigs, fixtures and machine parts for scores of satisfied customers.

This long-time experience has produced an efficient, modern shop splendidly equipped to give you the quality and service you want at attractive prices.

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E MOST COMPLETE LINE • THE MOST VERSATILE LINE

TRANE Announces the CLOVERLEAF Diffuser

Bringing New Adjustability to the Projection Heater

Every day more and more uses are found for the efficient Trane Projection Heater. Now, with the announcement of the new Cloverleaf Diffuser, applications for the Projection Heater become almost limitless.

The Cloverleaf Diffuser gives full adjustability to the air flow from Projection Heaters. Air may be directed in patterns ranging from straight down to almost straight out. The flow may be adjusted to throw heat outward in one direction and downward in another, simultaneously. It is a matter of a moment to set the diffuser for *any* desired air distribution.

The adjustability of the Cloverleaf Diffuser remains an advantage even after installation. When machines, equipment, or partitions are changed, the Cloverleaf can be readjusted immediately to the changed heat requirements. The need for re-installing the Projection Heater will, in most cases, be entirely eliminated.

Another Engineering Advancement

The Cloverleaf Diffuser is the second major innovation in the Trane Unit Heater line within a few months. The recently-announced Trane Model H Unit Heater is being given an enthusiastic reception all over the country.

The Trane Model H Unit Heater and the Projection Heater are just a part of the most complete line of heating and air conditioning products in the industry. So complete is this line that architect, engineer, and contractor can select the right combination of Trane Products for any application. Over 200 Trane Sales Engineers in 85 principal cities offer their constant cooperation. THE TRANE COMPANY, LA CROSSE, WISCONSIN. *Also*: TRANE COMPANY OF CANADA, LTD., TORONTO, ONTARIO. *Manufacturing engineers of heating and air conditioning equipment.*

More Efficient Air Flow in Any Desired Direction

Where the Projection Heater is used with a low ceiling, the Cloverleaf spreads the flow to keep hot air currents from workers' faces.

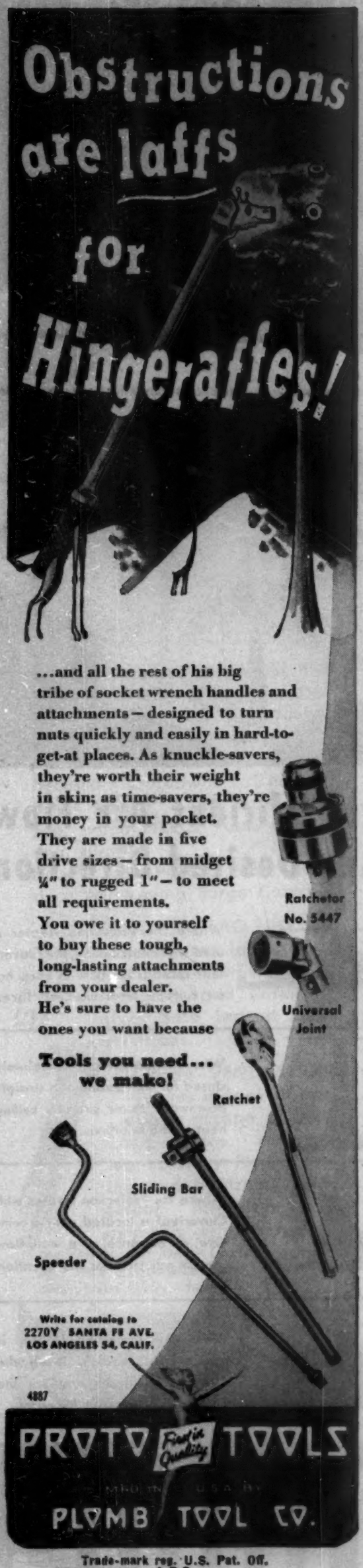
When the Cloverleaf is completely closed for high positions, a straight downward throw projects ceiling heat to the floorline.

Where the Projection Heater with Cloverleaf is located near a window, an entrance, or a wall, flow can be adjusted for the situation.

When the Projection Heater is mounted at medium level, the Cloverleaf Diffuser provides the pattern that gives it its name.

TRANE

HEATING AND AIR CONDITIONING


Obstructions are laffs for Hingeraffes!
...and all the rest of his big tribe of socket wrench handles and attachments — designed to turn nuts quickly and easily in hard-to-get-at places. As knuckle-savers, they're worth their weight in skin; as time-savers, they're money in your pocket. They are made in five drive sizes — from midget ¼" to rugged 1" — to meet all requirements. You owe it to yourself to buy these tough, long-lasting attachments from your dealer. He's sure to have the ones you want because
Tools you need... we make!
Ratchetor No. 5447
Universal Joint
Ratchet
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PROTO Finest in Quality TOOLS
PLUMB TOOL CO.
Trade-mark reg. U.S. Pat. Off. A.B.S.

THEY SAY AND DO

Strike Bonuses Termed Legal

Bonus payments have been made to 2400 R. H. Macy & Company employees who worked despite picket lines during a strike by delivery men in 1946. The Appellate Division of the New York State Supreme Court sanctioned the payments as it overruled a decision of the State Labor Relations Board that the bonuses would constitute an unfair labor practice.

Danger Found in Annual Wage

Annual wage plans might weaken the national economy "if hastily taken in large doses," is the warning voiced in a recent report by the National Planning Association.

"In the steadier of sectors of the industry," the report states, "the limited experience to date indicates that the guaranteed annual wage has real possibilities and it deserves careful consideration by top management. However, a company which has experienced or expects to experience wide fluctuations must limit the plan in many ways. Without such limitations, the business firm risks destruction of itself as a job-making machine."

Five of the most common limitations and restrictions that have developed were listed by the report: (1) The company may transfer workers to other jobs; (2) the company's obligation to an individual worker has a definite limit; (3) the company's obligation is limited to some portion of the working force; (4) the company's gross financial liability is limited to any one year; and (5) the company's hourly or weekly employment obligation is limited to any one year.

New Casting of Steel Permits Plant Relocation

Development of a method and a simple machine that will revolutionize steel-making was jointly announced recently by Republic Steel Corporation, Cleveland, and Babcock & Wilcox Tube Company, New York.

Steel can now be cast in one step—instead of many expensive ones. The process removes from the present production method the most massive and expensive parts of steel plants, such as equipment for ingots, soaking pits, and blooming mills. Savings of at least $3 a ton are forecast.

Continuous casting utilizes a new mold small enough to fit in a family garage.

Not only will a slash in steel plant costs be possible, but widespread dislocation of the industry may take place. In effect, this process is an answer to the recent forced abandonment of the basing-point method of steel sales.

Now, steel companies will be able to move to communities too small to sustain a large and completely integrated steel mill under present conditions.

New England Scrap Drive to Ease Severe Shortage

New England industry has united to alleviate a critical, local scrap-iron shortage which exists because a blast furnace supplying 50 per cent of the region's pig iron burned out. Pig iron producers elsewhere in the country have been urged to help supply the area's monthly requirements of 15,000 tons.

Pensioners Aided by Living Cost Adjustment

A temporary pension adjustment plan has been announced by Socony-Vacuum Oil Company, Inc., to increase benefit payments to retired and retiring employees. The object is to help retired employees offset the effects of increased prices. About 2600 persons will benefit from the plan.

Alcoholics Lose 28,000,000 Man-Days

About 28,000,000 man-days of labor are lost annually by alcoholics, United States corporations estimate. To combat this social disease, many corporations are working with Alcoholics Anonymous to reduce the number of chronic drinkers in their employ. Some 100 du Pont employees have reported to A.A. clinics. Alcoholism has been arrested in 65 of the cases.

Housekeeping Emphasized in Employee Bulletin

Importance of good industrial housekeeping was impressed upon the thousands of employees of Bethlehem Steel Company by exclusive treatment of this subject in the 16-page August, 1948, issue of *Bethlehem Review* distributed to employees and stockholders alike.

The words "Good Housekeeping Number" on an attractive cover, illustrating an electric furnace in photo-color, gave an immediate clue to the bulletin's contents. The first page bore a message from the company's chairman, E. G. Grace, reviewing the company's aims and achievements. He reminded employees that good housekeeping is essential to worker safety and good health, and to good community relationships;

ATOP THE WORLD'S TALLEST BUILDING . . . yet not high enough! Television's need for unobstructed, long-range broadcasts may be met by planes in the stratosphere, relaying signals from the earth. Engineers working on this problem are confident of ultimate success.

With like confidence, Roebling blazes new trails in developing and making products vital to communication and all other industries. And the widespread confidence reposed in Roebling is our most guarded asset. Leadership is maintained only by constant progress . . . our ideal is to make Roebling products and engineering service the best obtainable anywhere, *any* time.

WHEN TO SPECIFY ROEBLING *Preformed* WIRE ROPE

WHEN IT WILL SAVE YOU MONEY is the time to specify Roebling Preformed Wire Rope. Wherever wire rope is subjected to severe bending, Roebling Preformed is an outstanding money-saver. On thousands of installations it lasts far longer than Non-Preformed ropes . . . pulls down performance costs to an all-time low.

Great resistance to fatigue from bending helps give Roebling Preformed a long life, but you can chalk up other big advantages. Preformed is not inclined to twist and kink . . . is easy to handle and install. It can be cut without seizing. Broken wires lie flat . . . don't injure hands or chew up drums and sheaves.

Get your Roebling Field Man's advice about Preformed and the possibility of its saving you money. You can act on his suggestions with full confidence for he *knows* wire rope, how to choose the *right* one, how to maintain it for top service. Write or call him at your nearest Roebling branch office.

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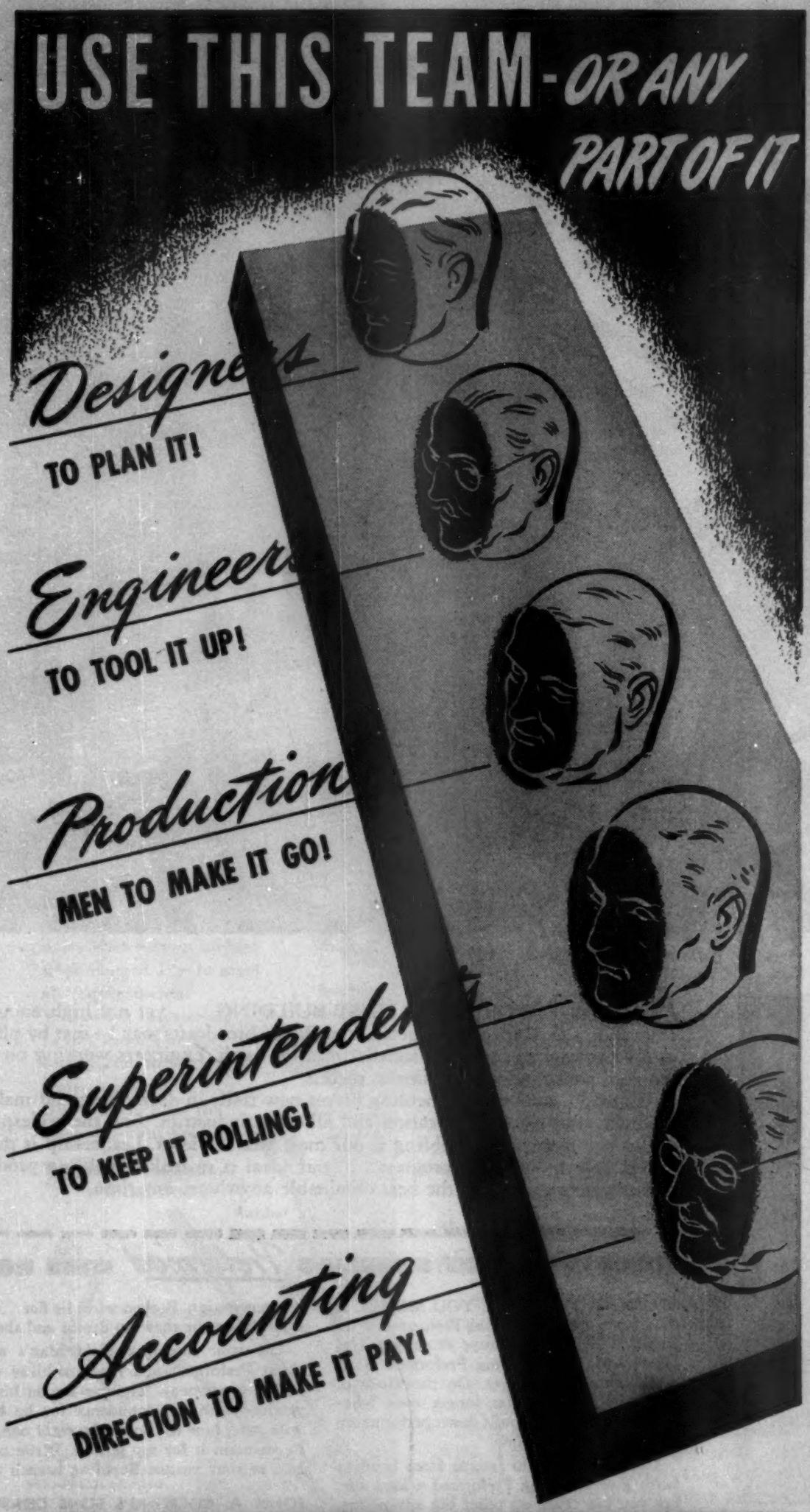
★ *WIRE ROPE AND STRAND* ★ *FITTINGS* ★ *SLINGS* ★ *SUSPENSION BRIDGES AND CABLES* ★ *AIRCORD, AIRCORD TERMINALS AND AIR CONTROLS* ★ *AERIAL WIRE ROPE SYSTEMS* ★ *ELECTRICAL WIRE AND CABLE* ★ *SKI LIFTS* ★ *HARD, ANNEALED OR TEMPERED HIGH AND LOW CARBON FINE AND SPECIALTY WIRE, FLAT WIRE, COLD ROLLED STRIP AND COLD ROLLED SPRING STEEL* ★ *SCREEN, HARDWARE AND INDUSTRIAL WIRE CLOTH* ★ *LAWN MOWERS*



THEY SAY AND DO (continued)

also, that it makes for more efficient production, a better product, and lower-cost operation, hence greater security of employment.

Subsequent pages dealt with the scope of the job and with the basic principles of good industrial housekeeping that have become a part of company policy. These include the joint responsibility of management and employees, and a systematic and a continuing program of action. Further, the bulletin showed how this program is being exemplified in a well-planned schedule of repairs and replacements for upkeep of buildings and equipment.

The policies of frequent painting, good lighting, landscaping, and other practices were documented by numerous photographs, including four special pages in full color to demonstrate effectively the use of color in many parts of all the company's plants. References were made to projects of a community and civic nature in which the company is cooperating. It is initiating, for example, a program of smoke, dust, and fume abatement.

The bulletin concluded with a recognition of the medical department's place in the program and a statistical review of its activities. Further interesting statistics, such as the replacement of 16,732 window panes, and the use of 42,922 packages of paper towels, 5040 brooms, 30,289 bars of soap in one year in one plant alone, clinched the message of the company's determination to do a good job of industrial housekeeping.

In other words, here was proof that a steel plant, a coal mine, and a shipyard, representative of the company's operations, could be clean places to work in if everyone would cooperate.

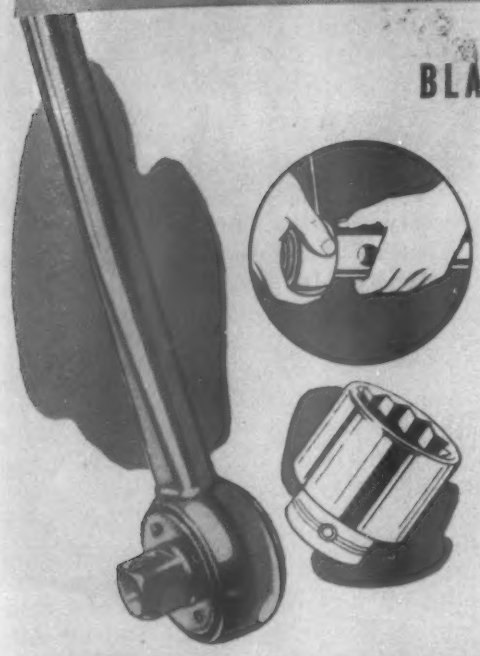
BEHIND THE BYLINE

Facts About *Factory's* Authors

G. L. Dobson (page 72) joined the Tappan Stove Company in 1940 as a production engineer, and is now head of the production engineering department. He received his B.S. degree in mechanical engineering and M.S. degree in industrial engineering from the University of Michigan. Following graduation in 1935, he was production engineer for the Ternstedt Manufacturing Company, Fisher Body Division of General Motors. He was employed in the same capacity by Chevrolet Gear & Axle Company. Dobson is a registered engineer in

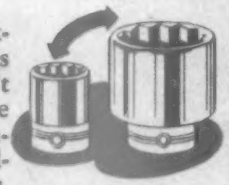
THESE BLACKHAWK PRODUCTS CUT YOUR MAINTENANCE AND PRODUCTION COSTS

BLACKHAWK SOCKET WRENCHES CUT YOUR COSTS 4 WAYS



LOCK-ON

This exclusive patented Blackhawk feature locks combinations together rigidly. Sockets can't come off except by thumb release button. Eliminates lost time, damage and injury from sockets falling in machinery, gear boxes, etc.



COMPLETE RANGE

Whether it's midgets or big brutes, you'll find a Blackhawk socket for the job. And the assortment of handles and attachments permit hundreds of combinations — eliminate wrench "specials".

HOT BROACHING

This *original* Blackhawk feature insures smooth socket walls — eliminates ripped socket walls and consequent cracking, rust and nut wear.

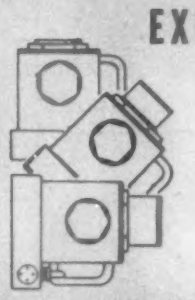
TORQUE INDICATORS

Blackhawk tension wrenches range in capacity from 33 to1000 ft. lbs. They assure you of correct tensions—eliminate bolt breakage, gasket blow-bys, assembly breakdowns, etc.

ONLY BLACKHAWK HYDRAULIC JACKS GIVE YOU THESE EXCLUSIVE ADVANTAGES

94% EFFICIENCY

Eliminates "man-killing" friction loss that cuts screw-type jacks to 12 to 30% efficiency.



MULTI-DIRECTIONAL OPERATION

Pump-on-side feature permits full power in any position vertical to horizontal.

LONGER LIFE

Exclusive Blackhawk process produces mirror smooth cylinders, reduces cup wear.

Porto-Power MAKES "SAMSONS" OUT OF MAINTENANCE MEN

ONE Man With a Porto-Power Can Do These Jobs

Pull Gears, Wheels and Pulleys

Porto-Power combination pulls quickly, smoothly, safely, without damage.

Raise Sagging Beams—

Porto-Power with attachments builds up to any length — works with full power at any angle.

Lift Machinery

Toe-lift Porto-Power attachments get under low machinery—remote control lets operator work at distance.

Pressing and Testing

Porto-Power can be used in press built from *free* Blackhawk plans. Can be gauge-equipped

Equipment Maintenance

Attachments adapt Porto-Power to dozens of jobs such as straightening frames, axles, etc.

"Coes" Machine Knives
BEST BY TEST

AGRICULTURAL
ENSILAGE
HAY AND STRAW
LAWN MOWER
VEGETABLE
SUGAR CANE

BOOKBINDERS
SHEARS
PASTERS
CUT-OFF
CORNER CUTTERS

DOCTOR BLADES
REFINER
LEDGER
RUBBER

LEATHER
SKIVERS
SPLITTERS
SHOE
FLESHING

PAPER AND PRINTING
GUILLOTINE
BOARD SHEARS
ELECTROTYPE
STOP CUTTERS
SHEETER
MATRIX SHEARS
RAG KNIVES
CORNER CUTTERS

TEXTILE
LEDGER BLADES
SPIRALS
LOOM BLADES

METAL SHEARS
SQUARING
ALLIGATOR

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VENEER
PLYWOOD
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SINCE 1830 Coes
LORING COES COMPANY
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TRADE MARK REGISTERED MICRO CROUND U.S. PATENT OFFICE

"MUGS" MINUTE ON THE LAM?

If your employees lose as little as ONE MINUTE PER DAY due to improper programming and work scheduling, YOU WILL LOSE $387 per 100 employees EVERY SIX MONTHS.

With either the MONTGOMERY *Synchronous* PROGRAM CLOCK OR PROCESS TIMER, you will have dependable, trouble-free automatic control. These clocks will exactly follow any preset schedule and turn on and off signals, machines, fans, heaters, music systems or any electrically controlled equipment, PAYING FOR THEMSELVES IN A FEW WEEKS. The CALENDAR SWITCH will disengage the control circuit for any preset 12 or 24 hour period. "MUGS" MINUTE can't get away!

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Manufacturing Co., 548 W. Washington Blvd., Chicago 6, Ill.
Please send me new *Montgomery Catalog*.
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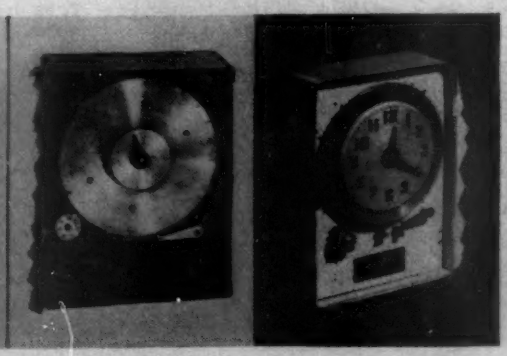


BEHIND THE BYLINE (continued)

the State of Ohio. His chief hobbies are sailing and playing bridge.

Clarence A. Raftrey (page 84) works manager of Cadillac Motor Division, General Motors Corporation, was first employed with the engineering department of the Lewis Spring & Axle Company, Jackson, Mich. He then spent 15 months in military service as an aerial photographer. Subsequently he worked for the Jackson Motors Corporation, the London Metal Products Company, and the Fox Machine Company, until the fall of 1926, when he joined the Chevrolet Motor Company in Flint, Mich. In 1929 he joined Cadillac, was made works manager in 1940. Raftrey's hobbies are outdoor sports and reading. He belongs to the Detroit Athletic Club, the Recess Club, the Board of Commerce and the Economic Club.

Michael F. Biancardi (page 103) is a Bostonian. In 1940 he graduated from MIT, having been employed by Air Conditioners, Inc., from 1938 to 1940. Beginning in 1940 he was assigned as an engineer in the centrifugal pump, Texrope, engine condenser, steam turbine assembly, hydraulic test, and centrifugal test departments at Allis-Chalmers. From 1942 until 1946, he was safety engineer in the health and safety department. Until February, 1947, he was in charge of that department and at that time became manager of the health and safety department.

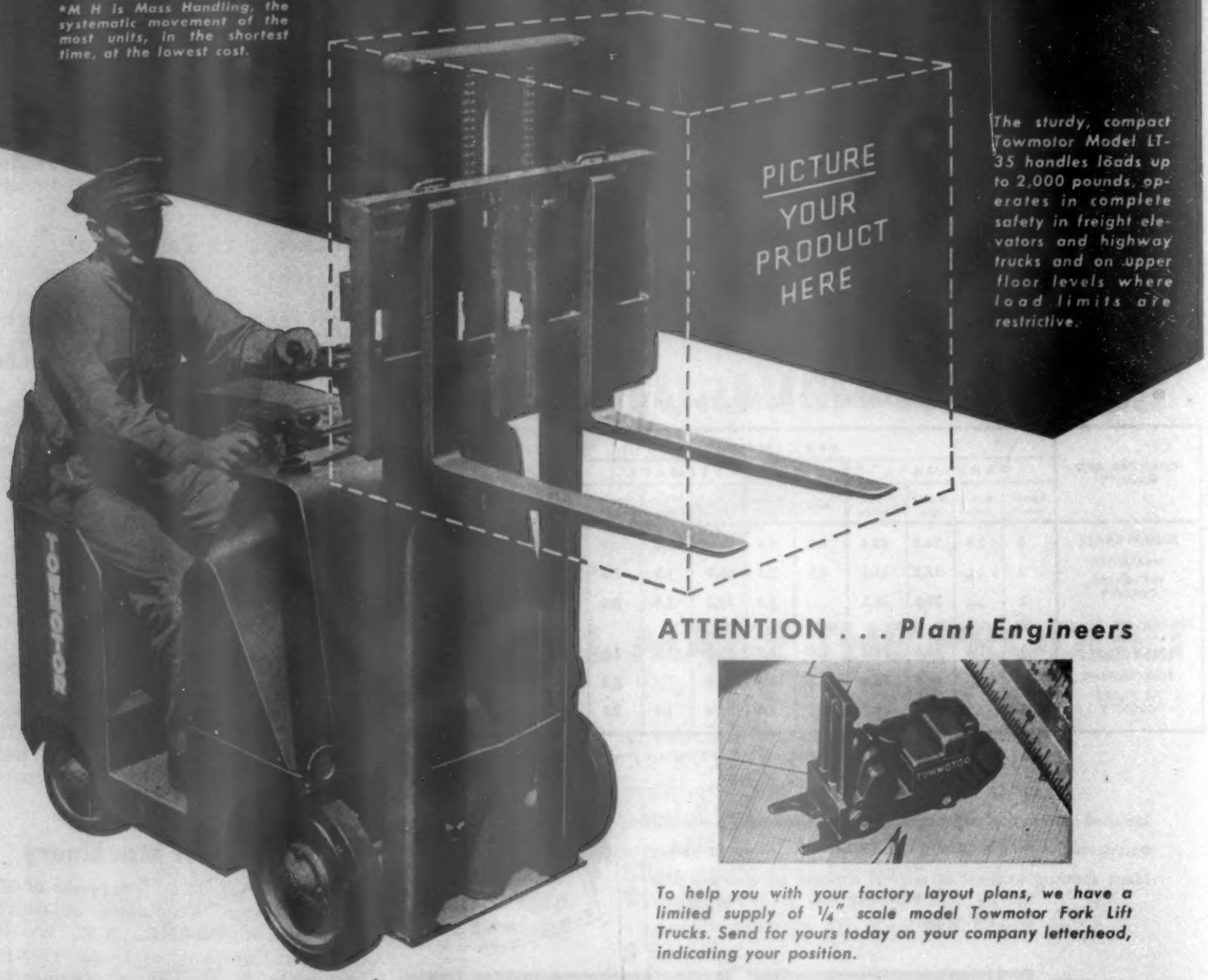
Carl H. Schultz (page 112) joined American Can Company in 1935 with considerable experience in heavy industrial contracting. Schultz, chief electrician at American Can, is a member of the New Jersey Association of Professional Engineers. His spare time is spent practicing the art of fishing.

Is HANDLING a Help or a Headache?

MODERNIZE WITH TOWMOTOR MH*

Towmotor Mass Handling is a sure cure for handling "headaches." Towmotor Fork Lift Trucks, Tractors and Accessories, gasoline-powered for full-time, full-power service, will increase productive output, provide savings in time, money and space. On every operation, large or small, versatile Towmotor equipment provides all the benefits of modern handling techniques . . . lifting, transporting and stacking materials and products of almost any size, shape or weight . . . helping increase capacity of machines and manpower. And Towmotor Mass Handling is economical, too — that's why more *professional handlers*, the men who have to make handling pay a profit, use Towmotor than any other fork lift truck.

*M H is Mass Handling, the systematic movement of the most units, in the shortest time, at the lowest cost.



The sturdy, compact Towmotor Model LT-35 handles loads up to 2,000 pounds, operates in complete safety in freight elevators and highway trucks and on upper floor levels where load limits are restrictive.

ATTENTION . . . *Plant Engineers*

To help you with your factory layout plans, we have a limited supply of 1/4" scale model Towmotor Fork Lift Trucks. Send for yours today on your company letterhead, indicating your position.

Is yours a *special* handling problem? Let Towmotor engineers help you work out special equipment to meet your specific needs. Write for details.

Plan to attend the 3rd National Materials Handling Exposition, Philadelphia, January 10-14, 1949.

TOWMOTOR CORPORATION
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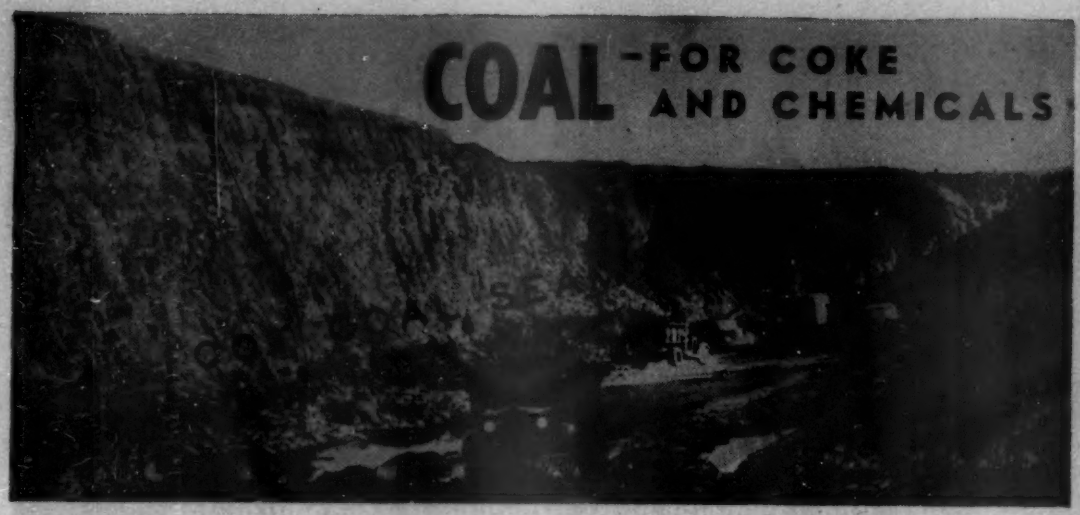
TOWMOTOR FORK LIFT TRUCKS *and* TRACTORS

RECEIVING • PROCESSING • STORAGE • DISTRIBUTION



According to the U. S. Geological Survey the reserve of bituminous coal in Oklahoma is estimated at 55-billion tons. Current production is from both strip (shown above) and underground mines.

Most of the coal is high-volatile but an excellent grade low-volatile coal (16-20%) is available in quantity for blending with high-volatile coal for making metallurgical coke. This is now being shipped to California, Utah and Texas for that purpose.

As a raw material for process industries—for example, its conversion to humic and carboxylic acids—Oklahoma's coal also offers great commercial possibilities.

● TYPICAL ANALYSES OF OKLAHOMA COALS *(Analyzed by U. S. Bureau of Mines)* ●

COAL BED AND COUNTY	PERCENT										B.T.U.	Softening Point of Ash
	PROXIMATE				ULTIMATE							
	Condition*	Moisture	Volatile	Fixed Carbon	Ash	Hydrogen	Carbon	Nitrogen	Oxygen	Sulfur		
HIGH-VOLATILE McALESTER PITTSBURG COUNTY	1	3.8	36.3	55.5	4.4	5.4	77.0	1.8	10.9	0.5	13,570	2,290
	2	....	37.7	57.8	4.5	5.1	80.0	1.9	8.0	0.5	14,110	
	3	....	39.5	60.5	....	5.4	83.8	2.0	8.3	0.5	14,780	
LOW-VOLATILE HARTSHORNE LE FLORE COUNTY	1	1.6	16.6	74.2	7.6	4.2	81.2	1.7	3.6	1.7	13,940	2,340
	2	....	16.9	75.4	7.7	4.1	82.5	1.7	2.3	1.7	14,160	
	3	....	18.3	81.7	....	4.4	89.4	1.9	2.5	1.8	15,340	

**Condition: (1) as received; (2) moisture free; (3) moisture and ash free*

Detailed information on Oklahoma's mineral resources is available on request, based on data by the Oklahoma Geological Survey. Maps showing location of mineral deposits are also available.

BOOKS

Industrial Electronics Reference Book

Written and compiled by the Electronic Engineers of Westinghouse Electric Corporation. John Wiley & Sons, 440 Fourth Ave., New York 16. 680 pages. Photographs, sketches, diagrams, graphs, tables, formulas, references, index. $7.50.

Basic theory of electrons and the design, application, and maintenance of industrial electronic devices, presented in an effort to put electronics on an understandable basis. Emphasis is placed on application information rather than specific apparatus because the many changes that are still taking place. Book explains and illustrates how to apply commercially available electronic devices. Recent developments in electronic instruments, motor control, dielectric heating of woods and plastics, resistance welding, X-ray and photoelectric devices are reported.

A Guide to Technical Writing

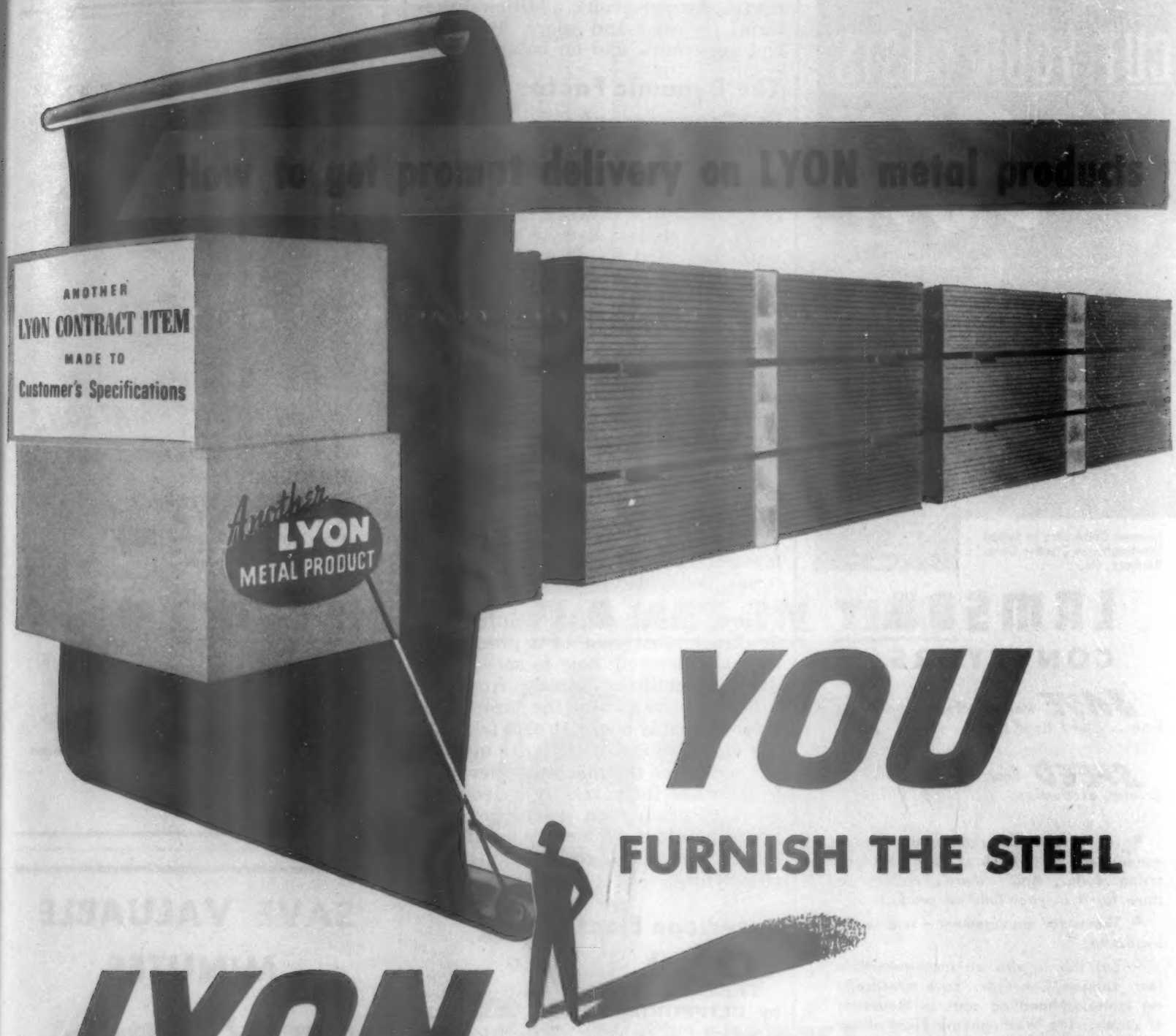
W. GEORGE CROUCH, Associate Professor of English, University of Pittsburgh, and **ROBERT L. ZETLER**, Lecturer in English, University of Pittsburgh. Ronald Press Co., 15 East 26th St., New York 10. 401 pages. Photographs, sketches, diagrams, graphs, sample reports and letters, index to English usage, appendixes A and B (bibliographies), index. $4.

Divided into two sections, the first covers the techniques of various kinds of communications, and the second reviews the principles of writing and provides a grammatical index. The business letter, technical article, the report, the abstract, and various types of oral communications are included in the first part. The basic principles covering the techniques of article writing is discussed in the second part.

Mechanics of Machinery

C. W. HAM, M.E., Professor of Machine Design, University of Illinois, and **E. J. CRANE, M.E.**, Western Electric Company, Chicago; formerly Associate in Mechanical Engineering, University of Illinois. McGraw-Hill Book Co., 330 West 42nd St., New York 18. 3rd edition. 538 pages. Sketches, diagrams, tables, formulas, appendix, problems, index. $5.

Written to give the reader an understanding of the dynamics of machinery and of kinematics, revised edition has included changes and improvements that bring the material up to date. It includes chapters on vibrations and critical speeds in



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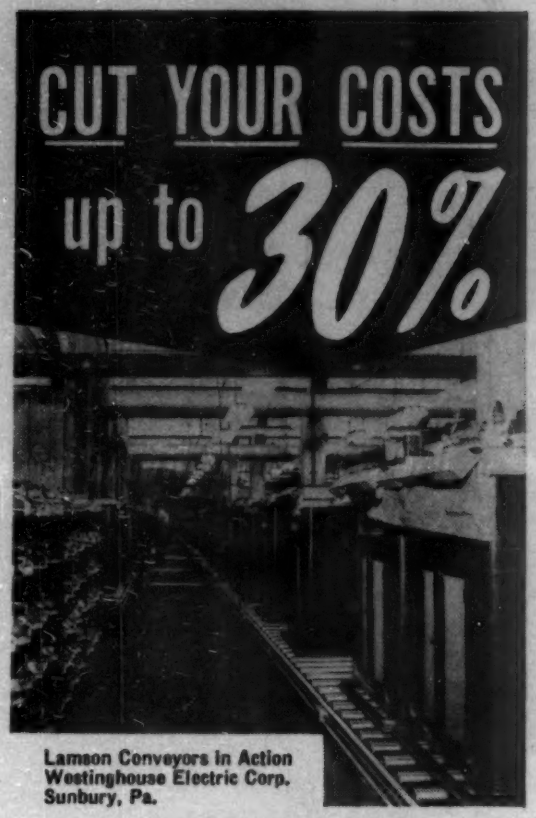

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The Dynamic Factor in Management

Edited by **FRANK ELLIS**, M.A., B.E., Principal, Melbourne Technical College. Whitecombe & Tombs Ptg., Ltd., Melbourne, Sydney, Perth, Australia. 221 pages. Sample forms, appendixes A and B, index.

A discussion of management, its problems and responsibilities, written by four members of the Melbourne Technical College staff who have been closely associated with management training.

Process Engineering

WILLIAM H. SCHUTT, President, W. H. Schutt Associates. McGraw-Hill Book Co., 330 West 42nd St., New York 18. 309 pages. Diagrams, sketches, layouts, tables, formulas, sample forms, index. $4.

How to determine the selling price or direct labor cost of a product to be manufactured, how to set up production methods directly from the blueprint, are two of the topics considered in this book. It also takes up the visualization of all types of manual processes for machine operation, how to use formulas for speeds and feeds of production machinery, and gives pointers on selection of materials, formulas for bending and channeling.

American Electricians' Handbook

TERRELL CROFT, with revision by **CLIFFORD C. CARR,** E.E., P.E. Head of Department of Electrical Engineering, Pratt Institute. McGraw-Hill Book Co., 330 West 42nd St., New York 18. 6th Edition. 1773 pages. Photographs, wiring diagrams and circuits, sketches, formulas, tables, index. $6.

Subtitled "A Reference Book for Practical Electrical Workers," this volume is based on the National Electrical Code. Discusses the fundamentals of electricity, and offers practical suggestions for selection, installation, operation, care, repair, and proper application of electrical apparatus and materials. Revised edition includes information on recent developments in the electrical field.

Trade Union Wage Policy

ARTHUR M. ROSS. University of California Press, Berkeley 4, Cal. 134 pages. Tables. $3.

The trade union as a political agency is the general theme of this book which discusses many union wage decisions and their influence on the role of the trade union as a

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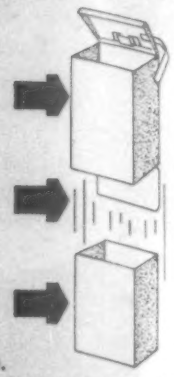

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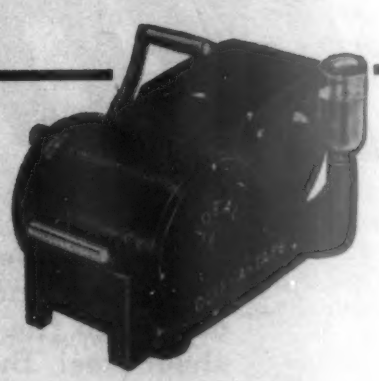

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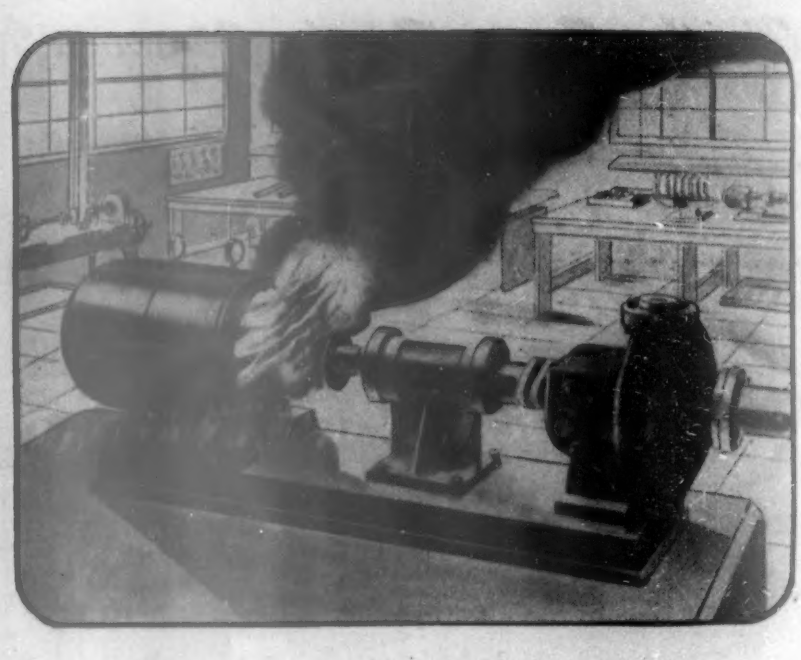

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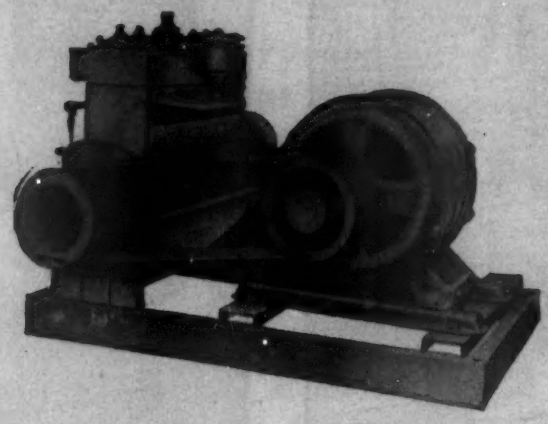

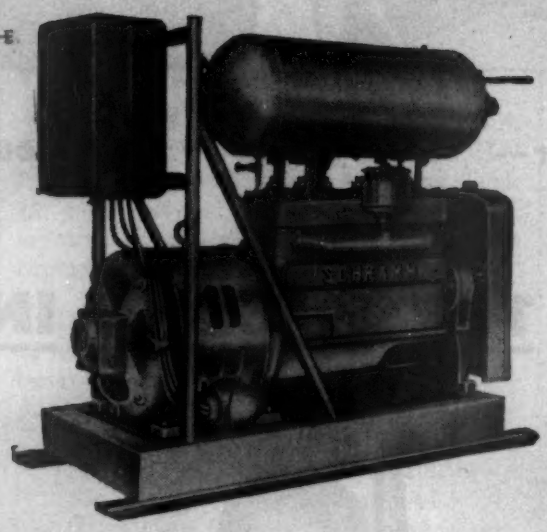

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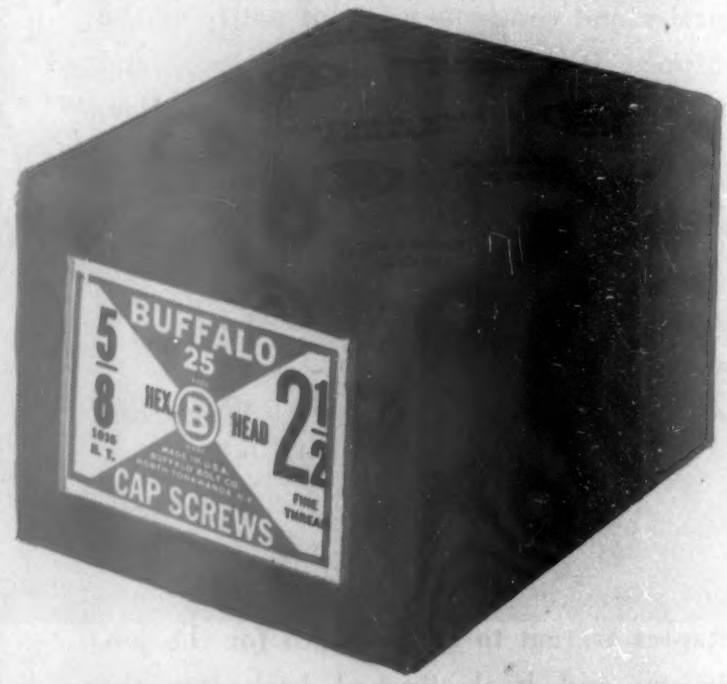

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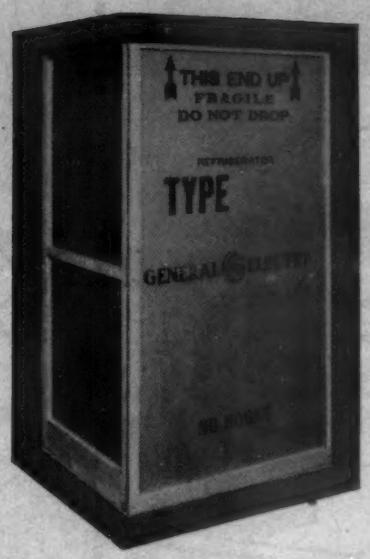
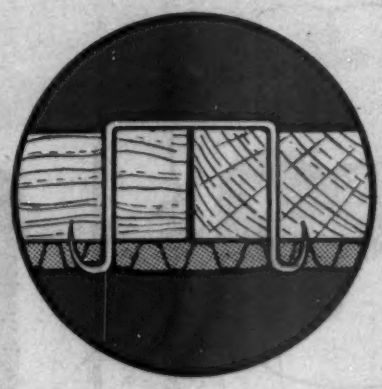


Shipping container for refrigerator made of corrugated board stapled to cleated frame.



Cross-section showing staples used to join cleats at corners and intermediate points.

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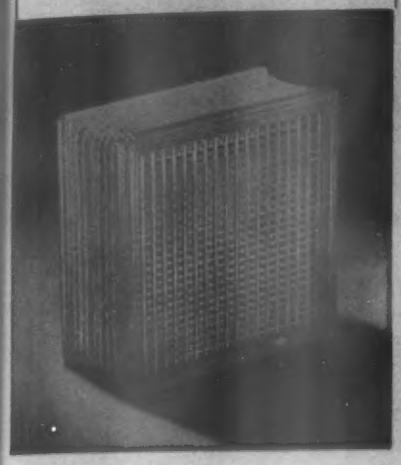

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